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Summary of New Instructions for Submitting Articles to *Academic Medicine*

(the retitled, redesigned *Journal* beginning in January 1989)

Academic Medicine will contain both peer-reviewed and non-peer-reviewed articles. Non-peer-reviewed articles will be accepted in three categories: major articles and essays, short opinion pieces, and letters to the editor.

Complete instructions for submitting articles will be published in the October 1988 and January 1989 issues. The following summary of these instructions gives general information for authors submitting articles for the peer-reviewed section of *Academic Medicine*.

Categories of peer-reviewed articles. *Academic Medicine* will have three types of peer-reviewed articles: major articles, short papers, and communication briefs.

1. Major articles should have no more than 15 standard double-spaced pages of typed manuscript text, 15 references (30 for literature reviews), and five tables or figures. It should have an abstract of 100–150 words.
2. Short papers should have no more than four standard double-spaced pages of text with no figures or tables, or three pages plus one figure or table, and no more than 10 references. It should have an abstract of no more than 100 words.
3. A communication brief should be 250 words in length (one double-spaced page) and have no reference list, figure, or table (one or two references may be cited in full in the text).

How to submit manuscripts. *Manuscripts are considered with the understanding that they are not under consideration elsewhere and have not been previously published.* Short abstracts of preliminary research reports presented at conferences and included in conference proceedings do not constitute previous publications; however, presentations longer than an abstract may disqualify the paper.

Papers are reviewed by specialist reviewers, the editor, and occasionally by consulting editors or members of the Editorial Board. All manuscripts will be edited critically by the editorial staff, and the authors must proofread and approve galley proofs.

All authors of accepted papers must assign copyright of the article to the Association of American Medical Colleges and must sign a statement of authorship.

Complete instructions for authors are available from the editorial office.

To submit a manuscript, send the following:

1. Two copies of the manuscript
2. A cover letter (signed by the first author or designated corresponding author) stating that the paper has not been previously published and is not under consideration by another journal and noting any inclusion of abstracts or portions of the paper in conference proceedings or similar monographs.

Format and references. Prepare the following materials:

1. Title page. Give the title (limited to two lines written in caption style, that is, it should not be a sentence); the byline (the authors' names; academic degrees; licensure titles); and the authors' identification (in sentence format, giving each author's surname, position held, department or division, institution, and city and state).
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3. Text. It may be written in first or third person.
4. Tables and figures. Each should appear on a separate sheet and have a descriptive legend that will make the figure or table clearly understandable independent of the text.
5. References. Citations should be numbered in the order in which they appear and be identified by superscripts. Citations should be prepared according to the *Chicago Manual of Style* (13th edition), with journal citations prepared in the humanities style (Style A). See sample entries below.

Sample References

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One author. Give the last name first:

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Tokarz, J. P., W. Bremer, and K. Peters. *Beyond Survival.* Chicago: American Medical Association, 1979.

More than six authors. List the first author only and indicate the others by "et al.":

Sutherland, Richard M., et al. *Pathways in Science.* New York: Horizons Publications, 1985.

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McMahon, Ann P. "Cost-Effect Care." *Med. Costs* 10(1986):108–110.

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A National Survey Concerning the Ethical Aspects Of Informed Consent and Role of Medical Students

Daniel L. Cohen, M. D., Laurence B. McCullough, Ph. D.,
R. W. I. Kessel, Ph. D., Aristide Y. Apostolides, Ph. D.,
Kelly J. Heiderich, and Errol R. Alden, M. D.

Abstract—The authors surveyed a national random sample of medical students (10 percent of the graduating class of 1985) to identify the ways in which the students obtained informed consent from their patients and to learn the students' views of certain issues concerning informed consent. The results showed that the students introduced themselves to patients using methods that the authors grouped by levels of forthrightness. Those students who introduced themselves as medical students differed in their views on selected informed consent issues from students who introduced themselves as physicians. In general, all the students were less forthright about their status when given the opportunity to perform invasive procedures. Student gender, type of patient, and type of hospital were statistically associated with the students' behavior, according to bivariate analysis. After multivariate regression analysis, however, only the actions of the students' role models (residents and attending physicians) remained significantly associated with the students' behavior. The authors conclude that because some aspects of student behavior are at odds with the requirements of informed consent, medical educators must scrutinize the ethical dimensions of the policies they establish.

Third-year medical students begin their practical clinical training in teaching hospitals, at the bedside, with real patients. In this setting they are faced with the ethical issue of administering medical services before they are licensed to do so, even though they are supervised by licensed members of their faculty and the house staff.

The provision of medical care to patients in teaching hospitals is governed by the guidelines issued by the Joint Commission on Accreditation of Hospitals (1). Two key items in these guidelines are the right of patients to be informed about the status of their health care providers and their right to give or withhold consent for the medical care proposed for them. The report of a federal commission on medi-

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Dr. Cohen is associate professor, Dr. Alden is professor, and Ms. Heiderich is research assistant, Department of Pediatrics, and Dr. Apostolides is associate professor, Department of Preventive Medicine and Biometrics, all at the Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Bethesda, Maryland. Dr. McCullough is professor, Department of Community and Family Medicine and the Kennedy Institute of Ethics, Georgetown University, Washington, D.C. Dr. Kessel, now retired, formerly was dean of the Graduate School, University of Maryland, Baltimore.

cal malpractice also supports these guidelines (2).

The authors of the present study maintain that implementation of the informed consent guidelines as they pertain to medical students can most reasonably be interpreted to mean that the students disclose their status to all patients for whom they provide any form of care and that they obtain patient consent for this care. The present study describes self-reported behavior regarding adherence to the guidelines of informed consent and relates this reported behavior to selected student attitudes and beliefs about the appropriateness of the guidelines and about who is responsible for their implementation.

Methods

The target population for this survey consisted of all third-year medical students enrolled in any of the fully accredited four-year allopathic medical schools in the continental United States in 1984. A computerized list of these students maintained by the Association of American Medical College was used to select a stratified random sample of 2,500 students, subsequently reduced to 2,411 because three medical schools did not participate. The original sample represented one in six of all the 1985 graduates, and the probability of selection of one in six applied equally to students at each of the medical schools.

After pilot testing the survey questionnaire was mailed in May 1984 to the students just before the end of their first clinical year of study.

The questionnaire (available for review upon request from the first author) consisted of a series of statements or questions designed to describe behavior relative to student interaction with patients and to quantitate students' perceptions of obtaining informed consent for their involvement in the care of patients. Specifically, the questionnaire attempted to define what steps had been taken on behalf of students and what steps the students individually had taken with respect to clarifying their roles in the assessment and care of patients, with particular focus on student involvement in the performance of invasive procedures. Finally, the questionnaire contained a series of statements designed to ascertain the students' personal perspectives on the rights of patients in teaching hospitals.

Questionnaires were returned by 1,596 students (approximately 10 percent of the class of 1985), for a response rate of 66.2 percent. Upon return of the completed questionnaires, all identifying information was coded to preserve the confidentiality of the medical students and the schools. Aggregate results from the student survey and related variables obtained from parallel surveys of medical school deans and clinical department chairpersons, previously reported (3), were analyzed (4). Hypothesis testing was carried out using, as appropriate, either the Mantel-Haenzel test or the chi-square test for trend (5). Multivariate analysis used the stepwise linear regression model (6).

Results

Table 1 summarizes the students' reports of the methods they chose to introduce themselves to patients during their initial clinical clerkship in internal medicine. A majority of the students (61 percent), referred to in this study as group B, introduced themselves as medical students without further elaboration, assuming that the patients understood that they were not yet physicians. Another group of students, comprising about 5 percent of the respondents, also introduced them-

TABLE 1

Number and Percentage of Third-Year Students in U.S. Medical Schools Who Introduced Themselves to Patients in Each of Four Ways During Their Internal Medicine Clerkships, 1985*

Groups	Number	Percent
Group A—introduced self as medical student, explained status	86	5.5
Group B—introduced self as medical student, did not explain status	971	60.8
Group C—introduced self as "doctor"	97	6.1
Other—used no single method consistently	442	27.7
Total	1,596	100.0

* The results are based upon responses of 1,596 medical students from a random sample of 2,411 students attending 120 allopathic U.S. medical schools.

selves as medical students but went further and explained to the patients that they were not yet physicians. This group is referred to as group A. On the other hand, some students, about 6 percent of the respondents, introduced themselves to the patients as "doctor" or "Dr. . . . " without mention of their educational status. This group is referred to as group C. Finally, a substantial proportion of the students (28 percent) stated that they did not consistently use any one method of introduction but rather alternated with approximately equal frequency between more than one of the methods described above. This group was deleted from subsequent analysis.

The students were then asked to report on whether they obtained specific patient consent to participate in the performance of various medical interventions. In the questionnaire these interventions were categorized according to whether they were judged to be invasive. As shown in Table 2, when given the opportunity to perform invasive procedures (lumbar puncture, bone marrow aspiration, paracentesis), the students reported a widespread reluctance to obtain patient consent for their performance of specific invasive procedures. Of the students who responded, only 13.1 percent always or usually obtained specific permission from patients, whereas 63.5 percent seldom or never obtained specific permission. Examination of these results revealed significant differences between the groups. For example, group A was twice as likely as group B to obtain permission, and group B was about 11 times more likely to obtain permission than was group C. It is worth noting here that several students noted various reasons for not obtaining patient permission. The most commonly stated reason was that the students perceived themselves as part of the health care team rather than individual providers and did not feel that clarification of their role was necessary. Other reasons included fear of possible rejection by the patient and concern about house-staff evaluation of their clerkship performance.

Students were then asked whether they agreed that hospitals should specifically inform patients at the time of their admissions of the involvement of medical students in their care. Table 3 shows that a majority of the students agreed with this statement, though the differences between the responses of group A and group C students are significant. Conversely, when asked whether they agreed that it is the students' responsibility to inform pa-

TABLE 2

Percentages of Third-Year Students, Categorized by the Ways in Which They Introduced Themselves to Patients, Who Obtained Specific Permission from Patients to Participate in Invasive Procedures During Their Internal Medicine Clerkships, 1985*

	Groups†			
Frequency	Group A ($n = 76$)	Group B ($n = 840$)	Group C ($n = 87$)	Total ($n = 1{,}003$)
Always/Usually	26.3	13.1	1.2	13.1
Intermediate	27.6	24.2	12.6	23.4
Seldom/Never	46.1	62.7	86.2	63.5

* Based on responses of 1,596 students from a random national sample of 2,411 students attending 120 allopathic U.S. medical schools; the percentages are based on the total number who answered the question.

† Group A students introduced themselves as medical students and explained that they were not yet physicians; Group B students introduced themselves as medical students but did not elaborate; and Group C students introduced themselves as "doctor" and did not explain that they were students. Differences between the groups were significant at $p < .001$: group A students were more likely to obtain consent than the other groups.

tients of their role, only 60 percent of the respondents agreed with wide and significant differences apparent between student groups A and C. These differences between groups persisted in student responses to the issue of hospitals obtaining consent from patients for student participation in various elements of care involving different aspects of invasiveness. Although most of the students did not agree with the hospital-consent statements, the group A students were much more likely to agree, particularly when dealing with the issue of consent for complex invasive procedures.

Table 3 shows rather homogenous opinions among the three groups of students regarding the rights of patients admitted to teaching hospitals. These opinions indicate that with few exceptions the students felt that patients should not have the right to reject student participation in their care in general but should be allowed to refuse student participation in some unspecified aspects of the care rendered. Once again, the group A students were more likely to be in agreement with these statements than group C students.

In order to identify factors associated with levels of student forthrightness (student groups A, B, C), selected response items were treated as independent variables and subjected first to bivariate and then to stepwise linear regression analysis. The selected response items were: demographic characteristics, reported behavior of the house staff, exposure to specific instructions from both medical schools and the departments of internal medicine, and anticipated medical career specialty. The multiple stepwise linear regression analysis used a general linear-models procedure to detect the independent contribution of each of the above factors to student behavior (groups A, B, C). For each factor, categorical levels were assigned on a scale of 0 to 6 in such a way that the association of each factor with student forthrightness was linear. Missing information was assigned the midpoint score. Table 4 displays the crude (bivariate) and the multivariate results for selected independent variables.

Contrasting group A and group C reveals that members of the former had a greater likelihood of being female, of hav-

TABLE 3

Percentage of Third-Year Medical Students in Internal Medicine Clerkships, Categorized by the Ways in Which They Introduced Themselves to Patients, Who Always or Usually Agreed with Statements Concerning Informed Consent, 1985*

Statements	Groups†			p value for difference between groups A and C
	Groups A ($n = 86$)	Group B ($n = 971$)	Group C ($n = 97$)	
Hospitals should inform patients of student role.	94.2	85.9	74.2	< .001
Students should inform patients of their role.	87.2	63.3	6.2	< .001
Hospitals should obtain consent for student involvement in:				
general care	58.1	54.6	37.1	< .01
pelvic examination	50.0	30.9	11.3	< .001
simple invasive procedures	33.7	17.3	5.2	< .001
complex invasive procedures	68.6	44.0	25.8	< .001
sensitive discussions.	43.0	27.0	15.5	< .001
All patients are "teaching patients."	25.6	31.9	32.0	N.S.
Patients have the right to reject student participation in:				
some aspects of care	90.7	79.2	74.2	< .01
all aspects of care.	57.0	45.2	40.2	< .02
Some seriously ill patients should not be used as teaching patients.	52.3	46.5	38.1	N.S.

* Based on responses of 1,596 students from a random national sample of 2,411 students attending 120 allopathic U.S. medical schools.

† Group A students introduced themselves as medical students and explained that they were not yet physicians; Group B students introduced themselves as medical students but did not elaborate; and Group C students introduced themselves as "doctor" and did not explain that they were students.

ing served their initial clinical internal medicine clerkship in a nonpublic hospital, and in having cared primarily for private patients. Conversely, group C students were more likely to have been male and to have been caring for nonprivate patients in public hospitals. With regard to the effect of institutional policy and the influence of role-model behavior, the above data suggest that group A students tended to have been introduced by the house staff to patients as students and tended to have come from a school where it is the policy of the internal medicine department chairperson that students introduce themselves as such. To a similar degree, group C students tended to have been introduced by the house staff as "doctor" or "Dr. . . . " or to have come from a school where the stated policy of the internal medicine department chairperson was that students introduce themselves to patients as "doctor." The regression analysis confirmed the independent contribution of these variables but failed to confirm the independent contribution of hospital setting, patient characteristics, and student gender.

The study further contrasted group A and group C regarding differences in anticipated specialty choice. Group A students were more likely to anticipate a

TABLE 4

Numbers and Percentages of Students with Each Characteristic and Statistical Comparisons Between Groups for Third-Year Students, Categorized by the Ways in Which They Introduced Themselves to Patients, During Internal Medicine Clerkships, 1985*

Student Characteristics	Student Groups†			*p* value for comparison of groups A and C	
	Group A ($n = 86$)	Group B ($n = 971$)	Group C ($n = 97$)	Univariate Analysis	Multivariate Analysis
Being female	39.5	33.6	13.4	< .001	N.S.
In public hospital setting	13.9	16.7	25.8	< .03	N.S.
Usually saw nonprivate patient	36.0	42.3	53.6	< .01	N.S.
Usually introduced by house staff members					
As student	64.0	56.3	10.3	‡	
As "doctor"	17.4	16.2	66.0	< .001	< .001
In other way	18.6	27.5	23.7	< .01	
Received formal instruction from medical school on way to introduce themselves	60.5	46.7	38.1	< .001	N.S.
With medical school policy that student be introduced					
As student	88.9	87.5	80.3	‡	
As "doctor"	1.4	2.5	3.7	N.S.	N.S.
No policy	9.7	10.0	16.1	N.S.	
With policy from internal medicine chairperson that student be introduced					
As student	88.1	83.3	70.1	‡	
As "doctor"	1.2	1.0	12.4	< .002	< .0001
No policy	8.3	7.1	9.3	N.S.	

* Based on responses of 1,596 students from a random national sample of 2,411 students attending 120 allopathic U.S. medical schools.

† Group A students introduced themselves as medical students and explained that they were not yet physicians; Group B students introduced themselves as medical students but did not elaborate; and Group C students introduced themselves as "doctor" and did not explain that they were students.

‡ Reference group for the analysis of the correlates.

career in family practice. Conversely, group C students are more likely to anticipate a career in surgery.

Discussion

As indicated at the beginning of this paper, medical students in clinical training are essentially unlicensed lay persons. Kapp (7) provided a useful analysis of the legal dimensions of involving students in patient care. He cautioned that "misleading patients about the educational status of their health care providers is fraught with potential pitfalls" for both students and faculty members. However, Kapp also noted that no one has been "sued successfully for failure to disclose training status to a patient," although he regarded such lawsuits as "a distinct possibility for the future." Thus, the legal implications of not informing patients about the involvement of students in their care remains for the most part at the theoretical level. When the law does not provide clear guidance, based on precedent, ethical considerations become paramount.

The ethical significance of the study findings raises important questions about the roles and responsibilities of both students and faculty members.

1. The role and responsibility of students. The data of the study suggest that

medical students do not always act in a manner consistent with a fundamental ethical requirement of informed consent—that information relevant to patients' decisions about medical care will be disclosed to them. Surely, the level of training and experience of student members of the health care team clearly are relevant items of information for the patients.

There are at least two plausible explanations for the lack of disclosure by the surveyed students. First, those students may have assumed that others—for instance, the teaching hospital, the attending physician, or the resident—had satisfied the disclosure requirement. This phenomenon, termed "floating responsibility" by Lidz and colleagues (8), amounts to no informed consent at all. The present authors' previously published data (3) corroborate Lidz's conclusions and suggest that any assumptions medical students may make that others, as a matter of policy or practice, have obtained consent for students' involvement in patient care are not valid. In addition, students may fail to recognize that they may have an ethical obligation to obtain consent for their involvement in patient care. In fact, over one-third of group B students and the vast majority of group C students held attitudes inconsistent with the view that students themselves bear the ethical responsibility to obtain informed consent for their involvement with patients.

Is it reasonable to expect medical students to bear such an ethical responsibility? The authors believe that it is. Informed consent is always required when there is a risk of harm to the patient. The involvement of students in patient care can cause such harm. A student's intervention, such as pushing a needle during a lumbar puncture, directly places the patient at a higher level of risk for pain and injury than the patient would encounter at the hands of a skilled practitioner. To hold that the health care provider who directly places the patient at risk has no ethical responsibility for obtaining informed consent for doing so distorts, if not ignores, the nature of informed consent and the patient-provider relationship as well. Even if there were no risk of harm when students are involved in patient care, the patient has the ethical right to know who is involved in providing that care. Such rights obtain and must be respected quite independently of whether there is a risk of harm. As Faden and Beauchamp (9) point out, one of the purposes of informed consent is to protect the patient's rights of decision-making. The responsibility to protect that right properly rests with the students.

Some might object that obtaining informed consent from patients for the involvement of students in their care would disrupt or even remove the educational opportunities for students, because too many patients would refuse. However, there is simply no empirical evidence reported in the literature to support this claim. In fact, obtaining consent by the student might enhance the educational process, because there are significant benefits to be gained by any student who recognizes the obligation to obtain informed consent. Students need to learn and master the clinical and communication skills that are required to obtain informed consent from patients. Indeed, these clinical skills are essential to the ethical practice of medicine and form the foundation upon which trusting physician-patient relationships are built. Attitudes and behaviors inconsistent with these clinical skills may well be carried over into residency and into eventual practice. Such a result should be unacceptable to medical educators.

2. The role and responsibility of faculty members. The data reported in this paper

indicate a solid empirical foundation for discussing the ethical responsibilities of medical educators, especially departmental chairpersons, who serve as role models for their attending physicians and residents, who are in turn the role models more visible to students. The data suggest that students' role models have a significant impact, for better and for worse, on student behavior.

Lidz and Meisel (10) provided persuasive evidence that the requirements of informed consent are frequently honored in the breach. A policy of introducing the student as "doctor" or the lack of an explicit policy sends the message to students that failing to abide by the requirements of informed consent is an acceptable attitude and behavior. The data in the present study suggest that such role models are in fact presented to medical students. The behaviors and attitudes that are fostered by such role models and that the authors have found among students exposed to such role models are directly at odds with the ethics of informed consent.

Conclusions

The authors urge that students be provided with better role models, whose behavior is supported by policies that require disclosure to patients of the student status of their caregivers, preferably by the students themselves. The first step toward accomplishing this goal is for faculty members to examine their attitudes regarding informed consent. If their attitudes are inconsistent with the ethics of informed consent, their students are not well-served. The second step is for faculty to teach students the intellectual and clinical skills necessary for obtaining informed consent. Recently, a distinguished group of medical educators (11) made a number of recommendations on curricular goals in medical ethics, including informed consent. They urged that students should "know and understand the elements of valid consent, "that is, adequate disclosure of information by the student, understanding of that information by the patient, and a voluntary decision by the patient. The student should "know what constitutes adequate information and be able to convey it in language a patient can understand" and "be able to distinguish between persuasion and coercion."

The intellectual skills needed by students to obtain effectively informed consent for their involvement in their patients' care can be taught in the classroom, perhaps in a class on medical ethics. The clinical skills can be taught directly, for instance, in practice sessions with mock patients, and by the role models provided by the attending physician and resident in obtaining consent for diagnostic and therapeutic interventions as a routine and fundamental part of patient care.

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Prior Training and Recommendations for Future Training of Clinical Research Faculty Members

LAWRENCE S. NEINSTEIN, M.D., and RICHARD G. MacKENZIE, M.D.

Abstract—A survey was conducted of the first authors of half of the research papers published in 18 leading peer-reviewed medical journals over a six-month period in 1986. The first authors of every other article (that is, alternate articles) published during this period were sent a questionnaire that assessed their previous research training and their recommendations for training of clinical research faculty members. Of the 772 physicians sent the questionnaire, 482 responded. Of these, 57% had had some research training in medical school, 52% had received such training during residency, and 87% had received it during their fellowships. Fifty-six percent had taken a formal statistics course, 31.4% had taken some computer training, and 87% had received research supervision in a nonstructured format (that is, no formal course work). Introductory biostatistics was the only formal course in any of the seven subject areas listed in the questionnaire that more than one-third of the respondents had taken, yet at least two-thirds recommended that researchers take formal courses in all of the seven areas listed. The investigators recommend for medical students and postgraduate trainees a graduated experience of research training and exposure that includes formal courses. *Acad. Med.* 64(1989):32-35.

One of the primary tasks of academic medicine is to foster research, which in turn makes important contributions to patient care and medical education. Yet medical research is facing at least two growing problems. First, clinical research faculty members may be having difficulties in developing and maintaining skills in research. This problem is probably compounded as shrinking economic support from both intramural and extramural sources forces faculty members to seek increasing percentages of their incomes through private practice.

Second, the number of medical students and residents interested in pursuing investigative endeavors is declining sharply. Overall, the number of physicians reporting research as a primary activity decreased by 50% from 1966 to 1975.[1] In 1960 a survey of senior medical students[2] showed that 39% had an interest in a combined research-teaching-practice position, whereas a similar investigation[3] showed that by 1982 this percentage had declined to 22.2%. A survey of Harvard medical graduates showed that in 1963, 49% of them gave research a high priority ranking, whereas this ranking fell to 2% of the graduates in 1976.[4] Morris[5,6] studied Iowa medical students and found that only 2% had an interest in a primary career in research or teaching, or both. On an Association of American Medical Colleges' poll of medical graduates, 70% reported their training in research techniques to have been either none or poor during medical school.[7] Levey and colleagues[8] also commented on the difficulty in attracting trainee physicians into the biomedical fields of investigation. He proposed several reasons for this difficulty, including an increase in the government's emphasis on primary care and family practice, the unstable nature of funding for research grants, and the fear physicians have of losing their recently acquired clinical skills.

These problems pressure medical educators to assure the best possible training for future researchers. At present such training is not emphasized during the student and residency years, since that period is devoted primarily to acquiring a knowledge base in clinical care. Only during the fellowship and junior faculty years do educators expect trainees or faculty members to acquire research skills. Several questions then arise regarding this transition from medical student or resident to academic faculty member. What constitutes appropriate training for research, and how is it acquired? When should this training be obtained? What formal courses are needed?

Methods

To investigate these questions, the authors conducted a survey of a group of physicians who had demonstrated their competence in research by pub-

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Dr. Neinstein is associate professor of clinical pediatrics and medicine, and Dr. MacKenzie is assistant professor of pediatrics and medicine, University of Southern California School of Medicine, Los Angeles; and Dr. Neinstein is coordinator of the Teenage Health Center, and Dr. MacKenzie is director, Division of Adolescent Medicine, Childrens Hospital of Los Angeles.

Correspondence and reprint requests should be addressed to Dr. Neinstein, Coordinator, Teenage Health Center, Childrens Hospital of Los Angeles, 4650 Sunset Boulevard, Los Angeles, CA 90027.

lishing their studies in major medical journals. It was assumed that these researchers would be a rich resource of guidance for planning a research training program for interns, residents, and fellows. Therefore, the researchers selected were asked, by means of a questionnaire, about their formal and informal research background and training. They were given a list of subject areas and asked to indicate which ones they had studied and which ones they would recommend for the training of students planning an academic career.

Participants in the survey were chosen by selecting the first author of every other research article (that is, alternate articles) published from January 1986 through June 1986 in 18 prominent peer-reviewed medical journals.*

Reviews, case reports, and special articles were excluded. Seven hundred and seventy-two (772) questionnaires were sent out; 482 physicians (62.4%) and 19 nonphysicians responded. The 19 nonphysicians were excluded from this evaluation. Five questionnaires were returned because no forwarding address was available.

Table 1
Mean and Median Percentages of Their Total Working Time That 482 Physicians Reported They Devoted to Four Different Responsibilities*

Responsibility	Mean Percentage	Median Percentage
Clinical activities	30.0	35.0
Research	36.0	35.0
Teaching	15.0	15.5
Administration	10.0	12.5

*Questionnaires were sent to one-half (772) of the first authors of research articles in 18 major peer-reviewed medical journals from January through June 1986. For a list of the medical journals, see the footnote in the text.

Results

The mean age of the 482 physicians who responded was 42.6 years. Ninety percent were male. Most respondents (83%) had had three or more years of residency, and most (87%) had had two or more additional years of fellowship. The specialties of the respondents included internal medicine, pediatrics, obstetrics-gynecology, and surgery. Seventy-four percent were on a tenured academic track; 12.9% were nontenured, full-time academic faculty members; 6% were part-time academic faculty members; 2.6% were in office-based private practice; and 2.6% were in hospital-based private practice. The percentages of their total working time that the respondents spent in clinical activities, research, teaching, and administration are shown in Table 1.

Fifty-seven percent of the participants had had some research training during medical school, 52% had had some during residency, and 87% had had some during their fellowships. Fifty-six percent had taken a formal statistical course, 31.4% had had computer training, and 87% described receiving their training in research by nonstructured supervision (that is, they had no formal classes). The participants were queried about their own formal training in specified areas of research techniques and skills and their recommendations for future trainees about training in these same areas. These responses are shown in Table 2.

Although introductory biostatistics was the only formal course that more than one-third of the group had taken, at least two-thirds recommended formal courses in all of the areas specified in the questionnaire. They felt that it would be best to teach biostatistics and computer training in college in preparation for medical school and residency. Most

Table 2
Percentages of 482 Physicians Who Reported Taking Formal Courses in Seven Subject Areas, Percentages of Them Who Recommended That Others Take Courses in Those Seven Areas, and the Time in the Educational Process They Recommended for Taking These Courses*

Subject Area	Took Formal Course	Recommended Others Take Course	Time Recommended To Take Course: College	Residency	Fellowship	Postfellowship
Introductory biostatistics	73.8	99.6	58.0	7.5	32.5	2.0
Advanced biostatistics	23.7	85.5	13.6	7.8	67.3	9.4
Computer use	19.0	95.0	56.0	6.2	33.2	4.4
Experimental design	26.7	90.0	12.6	12.3	69.4	4.0
Epidemiology	32.2	71.0	23.0	21.6	49.8	4.5
Sampling techniques	20.5	71.0	16.2	10.1	67.5	6.1
Health statistics	18.9	65.7	26.0	18.5	50.5	5.0

*Questionnaires were sent to one-half (772) of the first authors of research articles in 18 major peer-reviewed medical journals from January through June 1986. For a list of the 18 medical journals, see the footnote in the text.

**American Journal of Cardiology, American Journal of Diseases of Children, American Journal of Gastroenterology, American Journal of Medicine, American Journal of Obstetrics & Gynecology, American Journal of Public Health, American Journal of Surgery, Annals of Internal Medicine, Circulation, Endocrinology, Gastroenterology, The Journal of Allergy and Clinical Immunology, The Journal of Clinical Endocrinology and Metabolism, Journal of Pediatrics, New England Journal of Medicine, Obstetrics and Gynecology, Pediatrics,* and *Surgery.*

Table 3

Percentages by Medical Specialty, of 482 Physicians with Selected Characteristics and Mean Percentages of Their Working Time Spent in Selected Activities*

Specialty	Characteristic			Mean Percentage of Work Time Spent	
	Female	Male	On Tenure Track	On Research	On Clinical Activities
Internal medicine ($n = 202$)	7.4	92.6	75.1	40.8	30.2
Obstetrics-gynecology ($n = 43$)	10.2	89.8	82.8	23.8	46.3
Pediatrics ($n = 103$)	20.4	79.6	77.3	36.0	34.4
Surgery ($n = 134$)	4.1	95.9	74.6	21.8	50.8

*Questionnaires were sent to one-half (772) of the first authors of research articles in 18 major peer-reviewed medical journals from January through June 1986. For a list of the journals, see the footnote in the text.

felt that residency was not a good time for formal research instruction and that the fellowship years were more appropriate. Most of the study group had had two or more years of fellowship and advocated at least one clinical year and one research year for future trainees. They expressed strong support for National Institutes of Health programs, clinical scholar programs, or integrated formal courses in research methods, biostatistics, and design, or all of these approaches. However, the respondents' emphasis on formal training (that is, classes) during the fellowship years far outstripped their own formal training.

When the respondents were classified into two groups by their ages (younger than 45 and older than 45), there were no significant differences in their job profiles or their recommendations for research training. This lack of difference also held true when the same sort of classification was done using age 50 as the dividing point. Classification into groups by specialty, as shown in Table 3, indicated that the medicine and pediatrics faculty members devoted more time to research than did obstetrics-gynecology and surgery faculty members. More obstetrics-gynecology faculty members had taken advanced biostatistics courses than had respondents in any other specialty, and fewer medical faculty members had taken such courses (Table 4). Also shown in Table 4 are the respondents' recommendations for courses in specified areas. The sex distribution of the respondents and the times they spent in clinical and research activities, stratified by the specialities of the respondents, are listed in Table 3.

Discussion

This study centered on those investigators whose focus had been in the clinical areas, as reflected by the choice of journals reviewed. This bias could have influenced the subsequent profile of the study group. The median age of the sample, 42.4 years, could have indicated that the first authors chosen for this study were at a point in their careers when they sought recognition and promotion through publication. However, when the respondents were stratified by age, either above or below age 45 or above or below age 50, the responses did not differ significantly.

The present authors maintain that a graduated experience of research training and exposure should be planned for medical students and residents. This suggestion is supported

Table 4

Percentages, by Medical Specialty, of 482 Physicians Who Reported Taking Formal Courses in Each of Seven Subject Areas and Percentages Who Recommended That Others Take Courses in These Areas*

Subject Area	Internal Medicine ($n = 202$)		Obstetrics-Gynecology ($n = 43$)		Pediatrics ($n = 103$)		Surgery ($n = 134$)	
	Took Course	Recommended Course	Took Course	Recommended Course	Took Course	Recommended Course	Took Course	Recommended Course
Introductory biostatistics	71.1	99.0	72.9	100.0	80.0	100.0	74.0	98.6
Advanced biostatistics	16.8	83.1	36.4	89.1	28.6	88.0	26.8	81.2
Computer use	17.7	96.9	21.8	100.0	28.3	94.9	15.1	91.3
Experimental design	23.6	85.6	34.5	100.0	33.0	94.0	19.2	95.7
Epidemiology	26.2	66.3	32.1	83.6	40.2	80.4	22.5	53.1
Sampling techniques	16.4	64.3	30.9	74.1	24.0	78.8	17.8	75.8
Health statistics	16.8	60.7	19.6	79.6	21.6	74.2	13.7	58.5

*Questionnaires were sent to one-half (772) of the first authors of research articles in 18 major peer-reviewed medical journals from January through June 1986. For a list of the 18 medical journals, see the footnote in the text.

by a Health and Human Services study[2] in 1981 that strongly recommended research experience in medical school as a substantive factor in encouraging students to pursue an investigative career. In that study, the respondents felt that the opportunity for research in premedical training or medical school was one of the three major factors in choosing such a career. In medical school, more time could be planned for special seminars that provide exposure to outstanding faculty members involved in clinical or basic research. More intensive formal and informal instruction could follow in the fellowship years.

The respondents' responses provide suggestions for ways to structure the training of clinical researchers:

1. Basic statistics, research-method techniques, and computer techniques should be required at the undergraduate college level. Computer skills would help to facilitate the data management so integral to effective clinical research.

2. Early exposure in medical school to participation in clinical research projects should be encouraged. This exposure could be given by an ongoing seminar during the first year or by a summer course. The addition of one-to-one relationships of medical students with clinical research faculty members, who would serve as preceptors, would also encourage increased participation of these students in research pursuits.

3. Most respondents in the present study felt that the residency was not a good time for developing formal clinical research skills. However, a research seminar designed for house staff members and led by a clinical research faculty member on a regular basis was considered a possible valuable arrangement.

4. Assuming that the interest and desire to pursue research goals have been kindled in students by previous involvements in research, the postgraduate fellowship years are the ones that the respondents felt were most appropriate for developing skills in research. Training could include participation in a physician–investigator fellowship program, as outlined by Levey and colleagues[8]: nine months of formal lectures and laboratory training encompassing basic laboratory techniques, statistical analysis, teaching methods and the writing of manuscripts and grant applications; and 15 months devoted to a research project supervised by a faculty member. Alternatives include a National Institutes of Health fellowship, a Robert Wood Johnson Clinical Scholar fellowship, or a traditional two-to-three-year clinical research fellowship with one to two years of research time involving clinical course work and research methods. The departments of medicine, surgery, pediatrics, and obstetrics could collaborate to share resources in the formal training part of such a fellowship.

The authors thank Dr. Robert McAllister for his expert review of this manuscript and Ms. Sue Winett for her assistance with the research and manuscript preparation.

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Teaching Medical Students in Ambulatory Settings in Departments of Internal Medicine

JOAN FELTOVICH, M.A., TERRILL A. MAST, Ph.D., and
NORMAN G. SOLER, M.D., Ph.D.

Abstract—Clinical training in ambulatory settings is an increasingly prominent topic in medical education, but most descriptions of internal medicine programs in the literature concern training for residents. The authors undertook a survey of departments of internal medicine to obtain and assess information about requirements for ambulatory clinical experiences for medical students. The results show that few departments (24% of the 101 departments responding) required ambulatory care experiences for undergraduates. Most of the required programs had a goal of broad exposure to ambulatory-patient problems; almost none had special educational interventions to complement students' care of patients. The experiences that were incorporated into the clerkship in a single block of time were more favorably rated than the experiences that occurred intermittently throughout the clerkship. Inability to provide continuity-of-care experience was an important concern of the departments. Most programs had logistical problems, the most serious and frequently cited being the lack of faculty time for teaching. The authors raise concerns about the educational effectiveness of many existing programs and, given the problems with faculty involvement, about the long-term viability of these programs. *Acad. Med.* 64(1989):36–41.

Clinical training in the ambulatory setting is an important and increasingly prominent topic in medical education. There has been much discussion about the reasons such training is needed—or even whether such training is needed—and the problems to be resolved to establish it successfully.[1,2] Changes in the economics and structure of health care delivery are reducing inpatient lengths of stay, constricting the mix of medical problems represented in the inpatient pool, and increasing the proportion of medical care being delivered in ambulatory settings. As inpatients become less available, there is an increasing need for the traditional clinical training in inpatient settings to be supplemented by training in outpatient settings. The long-term implication of these changes is a need for more physicians trained to deliver care in ambulatory settings. Training in ambulatory settings has relevance not only for students planning careers in primary care but also for those who will enter most other specialties or subspecialties; the proportion of care delivered in ambulatory settings in most specialties and subspecialties is on the rise.[3]

Departments of internal medicine that are considering undergraduate training in ambulatory settings have limited information to assist in their deliberations, because most available discussions of relevant issues have focused on graduate medical education. For example, problems addressed in the literature usually concern the financing, structure, certification, and accreditation of only graduate medical education in the ambulatory setting, although implications for undergraduate medical education can sometimes be drawn. Similarly, discussions of what should be taught[2,4,5] or how it should be taught[6,7] deal almost exclusively with residents' training. With a few exceptions[8,9] most specific programs described in the literature are also for residency training.[7,10] A recently issued final report of the Association of American Medical Colleges, *Study and Comparison of Transition of Medical Education Programs from Hospital Inpatient to Ambulatory Training Programs*,[11] also noted a focus on residency training by those interviewed during that study. One study of training in the ambulatory setting that focused on undergraduate education was a 1986 survey of departments of family practice, medicine, and pediatrics.[12] It revealed that departments of internal medicine offered ambulatory care courses (required or elective) far less frequently than did departments of family practice or pediatrics, and had relatively small numbers of students. Considering the long-term effects of economic and organizational changes in medical care, departments of medicine will need to provide more clinical education in ambulatory settings.

As an information resource and to guide the development of our own plans for clinical education in ambulatory settings, we conducted a survey to determine the status of requirements for training in ambulatory settings, what goals departments have for teaching in these settings, how their programs are organized, and

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Ms. Feltovich is a researcher in the Department of Medicine and Department of Medical Education; Dr. Mast is assistant dean of continuing education; and Dr. Soler is professor of medicine; all at Southern Illinois University School of Medicine, Springfield.

Correspondence and reprint requests should be addressed to Ms. Feltovich, Southern Illinois University School of Medicine, Department of Medical Education (third floor), 801 North Rutledge, Springfield, IL 62702.

what problems they have encountered.

Method

We developed and pilot-tested a questionnaire regarding ambulatory care clinical experiences for medical students required by departments of medicine. In November 1986, it was mailed to the chairmen of the 129 departments of medicine in all medical schools and branch campuses in the United States that were listed in the *1986-87 AAMC Directory of American Medical Education.*[13] The chairmen were asked to forward the questionnaire to the clerkship director or other appropriate person for completion. A follow-up mailing occurred in February 1987.

The first section of the two-section questionnaire requested general information about ambulatory care training, such as whether there was a required ambulatory care component to the clerkship (or clerkships); whether other ambulatory care training was required in the department; plans for such training; the change in the number of inpatients available for education; and whether there was an ambulatory family practice clerkship in the school. The other section addressed specific information about required ambulatory care experience in the clerkship, if any, such as the duration of the ambulatory care component; the goals, structure, and orientation for the experience; how students were evaluated; and how the experience had been regarded by participants (students, faculty members, and program directors). In this part of the questionnaire, respondents were also asked to identify major problems encountered in organizing or conducting their ambulatory care training programs, the aspects of ambulatory care they considered to be most important for students to learn, and the aspects that have posed the most difficulty for students.

Results

The survey yielded general information about ambulatory care training and specific information about the programs required within departments of internal medicine. The specifics were characteristics, goals, and organizational structures of the programs; ratings of the programs by students, faculty members, and program directors; problems associated with the programs; and areas of training judged by directors to be difficult for students. Of 129 departments contacted, 101 (78%) responded.

Status

Of the 101 departments responding, 24 required ambulatory care experiences in the internal medicine clerkships. Another 20 offered courses that satisfied their schools' "selective" in ambulatory care training. In most cases, this selective could be fulfilled in family practice, medicine, or pediatrics, and took place during a four- to eight-week block of time. Fifty-seven departments reported having neither required nor selective ambulatory care experiences; however, 26 of these 57 were planning programs for ambulatory care training and nine of these were considering such plans for the future. (See Table 1.)

Table 1

Numbers and Percentages of 101 U.S. Medical School Departments of Internal Medicine, in Terms of the Status of Their Ambulatory Training Programs, Considering Options for Training Students in Ambulatory Settings, 1986–87*

	Options Under Consideration													
Status of Departments	Adding Ambulatory Electives		Developing a Selective		Adding within Clerkship or Creating Additional Clerkship		Planning in Progress (No Details Given)		Considering for the Future		No Plans		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Had a required ambulatory care experience	0	0	0	0	6	25.0	8	33.3	2	8.3	8	33.3	24	100
Offered a selective in ambulatory care setting	1	5.0	0	0	4	20.0	5	25.0	0	0	10	50.0	20	100
Had no required or selective ambulatory care experience	5	8.8	4	7.0	5	8.8	12	21.0	9	15.8	22	38.6	57	100

*Of 129 departments sent questionnaires, 101 responded.

Reasons for Ambulatory Care Training

We obtained information about three factors that may influence the incorporation of a requirement for ambulatory care training into the medicine clerkship: the availability of inpatients for instructional needs; belief in the efficacy of training in the ambulatory setting; and the presence of an ambulatory family practice or family medicine clerkship in the school. Only 30 of the 101 departments responding reported experiencing decreases in the numbers of inpatients available for medical education. These 30 comprised 50% of the departments that had requirements for ambulatory care training (12 of 24) and 28% of departments with no required or selective experiences (16 of 57). Sixty-eight respondents — representing 75% of departments with required ambulatory care experience, 70% of departments having selectives, and 63% of departments with no requirement or selective — felt that training in the ambulatory care setting can be educationally effective. Of the 101 respondents, 54 reported having required ambulatory family practice or family medicine clerkships at their medical schools during 1986-87. This total included 16 of the 24 departments that required ambulatory training in the internal medicine clerkship and 27 of the 57 departments that had no required or selective ambulatory care experience.

Characteristics

Twenty-four respondents described a total of 26 required ambulatory care components in their medicine clerkships. Of these 24 departments, 17 had components in junior-year clerkships; four had them in senior-year clerkships; two had them in both the junior and the senior clerkships (that is, two programs for each); and another had a program involving half a day per week for four years. Of these 26 different programs, 12 were block experiences that used from 7% to 50% of clerkship time, with a mean of 25%. The other programs took place one or two half-days per week for part or all of the clerkship, with the exception of two programs (one that involved half a day per week throughout four years of medical school, and one fourth-year program that permitted students to select either a six-week block of ambulatory care experience or half a day per week for 18 weeks).

Goals

The primary goal of most (92%) of the 26 required ambulatory programs described in the questionnaires was to provide the student a broad exposure to ambulatory problems in internal medicine and foster an awareness of the special aspects of delivering medical care in the ambulatory setting as opposed to the inpatient setting. In three cases, the ambulatory education experience was used to concentrate on developing skills in history-taking and physical examination. In only four cases did the goals specifically include ambulatory care education in subspecialties.

The 24 respondents that required training in ambulatory care were asked to list what they considered to be most important for students to learn during the ambulatory care experience. Seventeen of these respondents (65%) saw the experience as an important contrast to inpatient training, particularly with regard to how the ambulatory setting affects one's approach to problem solving and to patients (for example, establishing the relative priorities of problems and working within time constraints). Training in management and in psychosocial skills were also mentioned, but less frequently.

Structure

Most (23) of the 26 required ambulatory care experiences took place in clinic settings: general medicine clinics, clinics for sexually transmitted diseases, or other specialty clinics. Only three used private offices. Some programs included experience in two or more ambulatory settings. Eighteen of the 26 programs made use of a general medicine clinic for part of the ambulatory care experience. In all the reported programs, the students were usually supervised by attending faculty members or preceptors.

Program resources were used in different ways. In some cases, students were assigned two new patients per day in the clinic, for whom they did complete histories and physical examinations. Extensive time was then spent in presentation and discussion of these cases. Another program assigned students only one patient per clinic, and the student then studied that case in depth. However, most programs were designed to permit students to see a variety and number of outpatients in each clinic and to function much like attending physicians.

Only six (23%) of the ambulatory care training components were reported to have any special orientation or preparation for students. Moreover, only seven of the ambulatory care programs included educational experiences other than actual patient care that focused on issues and skills particularly germane to ambulatory care. The method of student evaluation most frequently used (in 20 of the 26 programs) was observation by the attending physician, but two or more methods for evaluating students were used for the ambulatory care components in eight of the clerkships.

Ratings

The respondents were asked how their programs had been rated (excellent, good, fair, poor, or not known) by students, faculty members, and program directors. The six programs that received the highest rating (excellent) by all three groups were compared with the four that received the next-to-lowest rating (fair; the category "poor" was not used) by all three groups. The relationship between program ratings and each of the following variables was examined: goals, structure, whether there was specific instruction or skill development for the particular experience, and types of problems experienced. The only apparent pattern was that most of the programs rated excellent (five of six) were those in which the ambulatory care component comprised a consecutive block of days for a portion of the clerkship.

In contrast, of the programs receiving only a fair rating, three of four involved one or two half-days per week throughout the clerkship rather than blocks of time. To test this relationship more generally across programs, in addition to those uniformly judged excellent or fair, values were assigned to the ratings reported for students, faculty members, and directors (fair = 1, good = 2, excellent = 3) and summed for each program. Those totalling 7 or more were classified as "above average," those with less than 7 were classified as "average or below." A chi-square test with Yates' correction indicated that the association between the ratings and the block or nonblock feature of the experience was significant at the $p < .05$ level; that is, block ambulatory experiences within the clerkship tended to be rated more favorably. It should be noted that the programs of the two respondents who reported continuity-of-care experiences that took place over extended periods (half a day per week for 18 weeks, and half a day per week for four years) had favorable ratings (8 and 6, respectively, using the numerical rating scheme described above).

Problems

The problems the departments cited with these ambulatory care teaching experiences were virtually all problems of time, space, and finances; they rarely concerned educational issues (for example, learning to evaluate complex, chronically ill patients), although many of the logistical problems could be considered educational as well ("It's difficult to keep the students working every minute of the day, given problems of patient flow, preceptor flow, and time, etc."). Problems relating to the time or commitment of faculty members were most frequently cited (for 10 of the 21 programs that had responses to this question). For example, some respondents mentioned that their programs were failing or being phased out because they had lost their directors or because there had been a change to a less-committed director. Many programs had difficulty finding enough physician participants and cited faculty members' lack of time to work with students as a problem. Cited less frequently (six of the 21 programs) were problems relating to the number or types of available patients, such as "recruiting patients to participate in the program" and "acquiring an adequate patient mix for valuable teaching."

The next most frequently-cited problem (in five of 21 programs) was a lack of clinic space to accommodate more students, or difficulty with clinic flow caused by lack of space (not having "enough rooms or enough money [to compensate] for what's inefficient practice"). Other responses (for nine of 21 programs) dealt with the scheduling of students for the experience or were general statements such as "the structure of the clerkship" that were not amenable to useful classification. Of the 26 programs, only one had no problem cited; on five questionnaires the item about problems was left blank. Another important concern identified in this section and in other areas of the questionnaire was both logistic and educational: the lack of experience in continuity of care. For example, one respondent noted the "difficulty in providing students with adequate continuity-of-care experience in the allotted time." Another respondent identified a problem resulting from this time constraint: "The student has limited feedback regarding patient management, outcome, etc."

Difficulties for Students

A question on the survey asked what aspects of ambulatory care posed the most difficulty for students. The most commonly cited aspect was learning to work within the time constraints of the ambulatory setting, particularly with regard to performing a focused history and physical examination. The other major area of difficulty frequently mentioned, a closely related one, was learning to rely on clinical data-gathering skills and problem-solving abilities to formulate reasonable diagnostic and therapeutic plans. In the words of one respondent, students "become much too used to relying on high-tech machine tests and laboratories to tell them what is wrong with their patients. Acute care experiences . . . tend to teach internists that every symptom or problem must have every possible disorder ruled out to a high level of resolution."

Discussion and Summary

The information obtained from the survey can be summarized in six main points. First, only one-fourth of the 101 schools responding required an ambulatory care experience in the department of internal medicine. These programs may have developed as a necessary response to decreasing numbers of inpatients. That is, half of the departments that already had such requirements indicated that they were experiencing decreases in the numbers of inpatients, or more limited ranges of cases, or both. Only 16 (28%) of the 57 departments with no requirement for training in ambulatory care reported decreases in inpatients. Although this relationship is suggestive, it is not statistically significant. The requirement for ambulatory family practice clerkships did not seem to influence whether internal medicine departments provided or were planning to increase ambulatory care experiences.

It has been argued in the literature that traditional inpatient clerkships may provide exposure to a limited range of cases and that a clerkship in ambulatory family practice can compensate for this limitation.[14] Such a clerkship could be seen as fulfilling a need to expose students to a more diverse case mix and obviating the need for ambulatory care experience in the medicine clerkship. In fact, a weak pattern in the opposite direction was disclosed by responses to the questionnaire. Sixty-seven percent of the schools that required ambulatory care components in medicine also required clerkships in ambulatory family practice. Again, this requirement may reflect necessity, in that some departments were experiencing declines in the numbers of inpatients and may have needed to make use of other settings. On the other hand, it may reflect a departmental goal of providing discipline-specific education in ambulatory settings. Of the 57 departments with neither required nor selective experience, only 47% had required clerkships in ambulatory family practice at their schools.

Most respondents, whether their departments required ambulatory care education or not, considered such experiences to be valuable, and 61 departments (60% of the total respondents) were making plans to increase training in ambulatory settings or were considering doing so in the future.

Second, of the 26 required programs, nearly all (24, or 92%) had a primary goal of providing students broad exposure to ambulatory patients' problems. Although only four departments included goals of education in subspecialties, the usefulness of giving students ambulatory training within subspecialties should not be overlooked by departments planning ambulatory care programs, given that many conditions treated by subspecialties are increasingly being treated in outpatient settings rather than in the hospital.

Third, few (seven, or 27%) of those with ambulatory care training requirements mentioned any special educational interventions to support or complement their students' actual patient-care experiences. In most cases students appeared to have been accommodated by existing outpatient clinics and patterns of teaching, rather than being taught in new programs especially designed to yield particular educational benefits related to clinical medicine in the ambulatory setting.

Fourth, for required ambulatory care training within the clerkship, students, faculty members, and program directors tended to rate block experiences more favorably; they tended to rate less favorably experiences involving only one or two half-days a week during the clerkship.

Fifth, almost all of the existing programs were in school-run clinics (23, or 88%) rather than private clinics (three, or 12%).

Finally, most programs (18, or 69%) suffered some logistics problems, which were often serious. The most frequently cited problem was lack of faculty commitment and time for teaching. Another was lack of sufficient numbers of patients or types of cases. Lack of continuity-of-care experience was also seen as a problem. However, a small number of respondents noted no major problems and appeared to have very successful programs. These clearly deserve further exploration.

These findings raise two significant concerns. First, since most of the required programs operated without orientation sessions or other instructional experiences specifically designed to meet the educational goals of ambulatory internal medicine, there is cause for concern about the educational effectiveness of these programs. Exposing students to ambulatory care is not the same as educating them in ambulatory settings. Second, the serious problems being experienced by many programs, particularly the problems of faculty commitment and time for teaching, raise concerns about whether these programs will survive.[15]

Some potential solutions to these problems have been proposed in the literature. Effectively recruiting and retaining faculty members for ambulatory care education might be brought about by providing incentives for research in ambulatory medicine, providing greater rewards for teaching in ambulatory care settings, or making greater use of private physicians.[1,12] Another alternative would be to greatly increase students' clinical competence before the clerkship years so that they can be an asset rather than a hindrance to clinic productivity and physicians' productivity in ambulatory settings.[16] The problem of limited number and types of outpatients might be resolved as departments develop ambulatory sites for teaching other than hospital outpatient clinics, for example, private offices, community clinics, and health maintenance organizations.

The educational benefits of extended continuity-of-care experiences, which are difficult to provide during a relatively short medicine clerkship, may have to be delayed until postgraduate training or acquired through other parts of the curriculum. Lack of experience in continuity of care is a noteworthy concern because the same problem is often encountered in training in inpatient settings, and those involved sometimes suggest that this aspect of training would be carried out better in ambulatory settings. However, the results of the questionnaire suggest that even when ambulatory settings are used, the problem remains. The time and structural constraints of internal medicine clerkships apparently limit the opportunities to follow up patients, either in the clinic as outpatients or in the hospital — in the case of an outpatient who must be admitted to the hospital. As a result, the student has limited feedback regarding the outcomes of management decisions or the effects of patient–physician interaction on the overall care of the patient.

One solution to this problem may be school-wide required programs that extend over several months or years and enable students to care for a panel of patients over time.[17] Clerkships with block ambulatory care components may be able to provide some continuity experiences for students. For example, one of our respondents described a successful program conducted within a medicine clerkship, involving six weeks of a 12-week clerkship and enabling students to follow their outpatients who were admitted to the hospital. This program received uniform ratings of "good" and was reported to have experienced no problems.

The information from this survey strengthens our conviction that the amount of teaching in ambulatory settings inevitably will increase. Although our report is descriptive rather than prescriptive, several implications for developing programs can be inferred. The educational goals for these programs need to be clearly identified, and specific instructional events or activities should be carefully designed to prepare students for their ambulatory care training and to focus their attention on the specific educational reasons for being there. For departments planning to incorporate ambulatory care training within the clerkship, a block experience may prove to be more successful than periodic short experiences. Because of time limitations and the nature of the chronic medical problems with which internal medicine deals, continuity-of-care goals are probably not achievable in programs embedded within internal medicine clerkships. Initial problems caused by insufficient numbers of outpatients are likely to be resolved over time. However, the lack of committed faculty time for teaching is a more serious problem, and creative avenues to approach it need to be explored. Although it may be possible for ambulatory care teaching to continue in some form, even under suboptimal conditions of space or financial support, faculty involvement is always necessary.

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JOHN A. GRONVALL, M.D.

The VA's Affiliation with Academic Medicine:

An Emergency Post-War Strategy Becomes a Permanent Partnership

Abstract—The creation of a cabinet-level department for veterans' programs is an occasion to review medical care of American military veterans, which dates back to colonial times. To meet the medical care crisis caused by large numbers of returning World War II veterans, the Veterans Administration (VA) entered into affiliations with U.S. medical schools, a partnership that provided physicians for veterans and allowed residents to complete graduate medical education. Increasing medical care needs of veterans of World War II and successive conflicts, and legislatively expanded entitlements, have contributed to sustained growth of the VA workload—which in turn has led to an expanded partnership with schools of medicine and allied health sciences. The affiliations continue to serve both partners well and to contribute substantively to society at large by fostering the production of medical manpower and advances in biomedical research. *Acad. Med.* 64(1989):61–66.

Passage of legislation to elevate the Veterans Administration to cabinet level makes this an appropriate time to reflect on the origins of the VA's hospital system and on the role the VA has played in American medicine through the affiliation partnership with medical schools and academic health centers. This new legislation, Public Law 100-527, signed by President Ronald Reagan on 25 October 1988, is statutory recognition of the extent to which VA programs have become essential components of the federal investment in health care and social support.

From the perspective gained in the 58 years since the Veterans Administration was created in 1930, two developments, spaced only 19 months apart, stand out as the underpinnings of the VA's new role, starting immediately after World War II, to help ensure that America would win the peace, as it had just won the war.

On 22 June 1944, President Franklin Delano Roosevelt signed the Servicemen's Readjustment Act of 1944, commonly referred to as the "G.I. Bill," a landmark piece of legislation that has been compared to the Homestead Act of 1862 for its impact on the development of our country's social infrastructure. The G.I. Bill established an explicit system of federal support for adult education. Although the immediate beneficiaries were the returning war veterans, who could thereby complete their higher education, the broader value to society of this investment in higher education is now well recognized.

On 30 January 1946, another VA document was signed, which remarkably expanded this concept of higher education as both a short- and a long-term investment. To take advantage of the academic environment to assist in solving the immediate medical care crisis created by the return of veterans with war-related medical problems, the VA Department of Medicine and Surgery's Policy Memorandum No. 2 established a program of affiliation between the VA and the nation's medical schools. Like the G.I. Bill, this document signaled the beginning of over four decades of a federal partnership with educational institutions, an interdependency that has benefited both partners while contributing to society at large.[1]

The VA–medical school partnership was rooted in the intention to provide a basic benefit to those who had served their country in the armed forces. It brought the country's medical schools and their residency programs into VA hospitals and thus helped guarantee quality health care to wounded, sick, and disabled veterans by providing an immediate answer to the physician-staffing dilemma VA hospitals faced. In the long term, it added significantly to the support of American medical education, provided a stable base for biomedical research, and influenced the direction of both medical education and medical practice.

Historical Development

Colonial America provided statutory benefits for veterans injured in military actions 140 years before the formation of the United States. In Plymouth Colony, a 1636 law provided that

> In case necessity require to send forces abroade, . . . that if any that shall goe returne mamed & hurt, he shall be maytayned competently by the colony duringe his life.

This concept of monetary benefits, borrowed from England, was adopted in other colonies, and was later enacted by the new nation as a federal responsibility for veterans of the Revolutionary War.

Dr. Gronvall is chief medical director, The Veterans Administration, Washington, D.C.

Correspondence and requests for reprints should be addressed to Dr. Gronvall, Veterans Administration Central Office, 810 Vermont Avenue, N.W., Washington, DC 20420.

The first U.S. governmental institutional medical care for veterans, as opposed to hospital care for active-duty military, was provided when the U.S. Naval Asylum was created in Philadelphia. This facility, which was finally opened in 1833, had been authorized by a 26 February 1811 act of Congress to "provide a permanent asylum for disabled and decrepit Navy officers, seamen and marines." Funding for both construction and operation came almost entirely from a fund created through a payroll deduction of 20¢ per month exacted from all naval personnel, initiated by federal statute in March 1799. This "prepaid closed-panel group health plan" (probably the first in America) allowed two veteran beneficiaries to enter the asylum in 1833, along with 13 navy personnel transferred from an old naval hospital.[2] This "asylum" operated both a domiciliary and a hospital, uneasily coexisting in the same building.

The U.S. Army followed later with a "military asylum" in Washington, D.C., subsequently named the United States Soldiers' and Airmen's Home, created by an act of Congress in 1851. Although this home was also primarily domiciliary, medical care and hospital care were furnished to veteran members. President Lincoln used this home as his summer White House, as did three other nineteenth-century presidents.[3]

The first veterans' homes and hospitals of truly national character came after the Civil War with the establishment of the National Home for Disabled Volunteer Soldiers (originally established as the National Asylum for Disabled Volunteer Soldiers by act of Congress in 1865). Between 1866 and 1930, 11 "branches" of the home were established across the country, with an aggregate capacity of approximately 25,000 members. At each branch, medical care and hospital care were also provided, although each was fundamentally domiciliary. These branches of the home formed the core of the VA domiciliary care program, which has evolved since 1930 to the present 27 domiciliary facilities with an aggregate capacity of 7,542 operating beds.

The most direct antecedent of the present federally operated system of veterans' hospitals was created by a 1919 act of Congress that charged the U.S. Public Health Service (PHS) with direct responsibility for operating hospitals to care for sick and disabled veterans of World War I. Appropriations were made for both the purchase of existing hospitals and the construction of others. During the fiscal year ending 30 June 1920, the PHS opened 46 hospitals (in addition to the 22 marine hospitals it was then operating) and cared for 87,000 hospitalized veterans. Because of continuing ambiguity between the other missions of the PHS and the rapidly expanding demand for veteran care, a new and independent Veterans Bureau was created in 1921. The PHS turned over to the bureau 57 hospitals (44 of them actually in operation), having an aggregate bed capacity of 17,500.[4]

This veterans' hospital program grew slowly, so that by 1930, when the modern Veterans Administration was created (by combining the U.S. Veterans Bureau, the National Home for Disabled Volunteer Soldiers, and the Bureau of Pension), there were 47 VA hospitals in operation, with an aggregate capacity of 22,700 beds.

Through the 1930s, the VA medical program grew primarily through acquisition of former military hospitals and the conversion of old soldiers' homes; there were 97 VA hospitals in operation at the end of World War II. As the war drew to a close, it was apparent that the VA's medical program was not prepared for the impending explosion of veteran patients. A 1945 *Saturday Evening Post* article said that VA hospitals were "short of doctors, nurses, beds, efficiency, and the medical spirit that gives patients faith in their doctors."[5]

President Harry S. Truman appointed the popular World War II "GI General," Omar N. Bradley, to prepare the VA for this challenge. The dimensions of the task were reflected in estimates that, within three months, the VA's 1,000 doctors would have 100,000 new patients.[6]

Among those called upon by General Bradley to confront this situation was Paul B. Magnuson, M.D., Chairman of Orthopedics at Northwestern University in Chicago. Dr. Magnuson quickly found that civil service red tape and the bad reputation of VA medicine added up to a nearly impossible recruiting situation.[7] But his medical school background convinced him that the VA's situation of "patients without doctors" could be solved through a working connection to the medical schools, which faced the problem of "doctors without patients" caused by the return of military physicians now seeking residency positions to complete their graduate medical education.

The framework for this new era of VA medicine was laid on 3 January 1946, when Public Law 79-293 formally established a Department of Medicine and Surgery in the VA. This legislation provided a new personnel system for VA physicians and dentists—a system freed from the civil service bureaucracy. The stage was now set for Magnuson's concept of affiliations between the VA and the nation's schools of medicine. The day after President Truman signed the new law, Northwestern University and the University of Illinois placed 56 residents at the VA's Edward Hines, Jr., Hospital, near Chicago. By the time the VA's Policy Memorandum No. 2 was signed at the end of the month to describe these arrangements formally, a second affiliation was in operation between the University of Minnesota and the VA's Fort Snelling Hospital, in Minneapolis. Similar affiliations were soon worked out in Boston, New York, and San Francisco.

The compelling need to expand VA medical care necessitated a massive construction program. Dr. Magnuson and VA Chief Medical Director Paul R. Hawley, M.D., quickly determined the value of selecting new hospital sites on or near campuses of medical schools. Viewing some of the VA's beautiful, but isolated, existing hospitals, Dr. Hawley said, "to hell with the scenery, I want the finest doctors."[5]

The number of VA hospitals increased dramatically, from 97 in 1942 to 151 eight years later. In the 1950s and 1960s the increase in new hospitals was more gradual, and several outmoded older facilities were replaced. Today's total VA system of 172 medical centers was reached in the late 1970s. The VA's construction program has continued in the form of major hospital replacements and renovations, and research facilities, educational facilities, and clinics have also been constructed.

Expansions and Adjustments

Figure 1 shows that the VA's inpatient workload has increased sharply over the years, reflecting not only growing demand for care from veterans but also significant expansions of eligibility for services. This increase also reflects a major change in health care delivery in that, although there has been a great increase in admissions, the average census has declined as a result of a shortening of the length of stay. Figure 2 documents even more remarkable increases in ambulatory care; the line showing number of visits annually is annotated at points when eligibility was legislatively broadened as successive Congresses and administrations recognized the VA's role not only in caring for medical problems related to military service (the "service-connected" veterans) but also as a health care safety net for medically indigent and poor veterans.[8]

The growth in the VA workload created a direct need to expand the VA-medical school affiliation program. In addition, the consensus in the 1960s that the nation faced a physician shortage of crisis proportion also led to an expansion of the VA's role in medical education. The congressional decision in the 1960s and early 1970s that federal support should be provided for training health professionals found ready expression through the VA-medical school affiliation program. The Veterans Administration Medical School Assistance and Health Manpower Training Act of 1972 (Public Law 92-541) provided 161 grants totaling over $300 million to schools of medicine and allied health professions.

Tangible legacies of this legislation are five new state medical schools, created with the proviso that they be affiliated with VA medical centers. (The five medical schools are located at Marshall University, West Virginia; Wright State University, Ohio; East Tennessee State University, Tennessee; Texas A&M University, Texas; and the University of South Carolina, South Carolina.) On a broader scale, the legislation also greatly spurred VA support for allied health care training. Thus the VA affiliation program, which originally involved only graduate medical education, expanded to include medical students and then to span the entire spectrum of health care training.

From 16,000 trainees in 1960—most of whom were medical residents—the program expanded to 105,000 trainees from 1,000 professional schools in the academic year 1987-88. Today, 134 of the 172 VA medical centers are affiliated with 102 of the nation's medical schools.

Over 50% of all physicians practicing in the United States have received part of their education in VA hospitals. Over the last decade, the VA has funded 12% of all U.S. residency positions in the medical and surgical disciplines relevant to veterans' care (which excludes only pediatrics and obstetrics-gynecology). Table 1 documents the VA's share of all national residency training slots by discipline.

The Research Connection

The post-World War II growth of the VA research program was a direct result of the affiliation with medical schools. The overriding goal of affiliation was to upgrade the quality of patient care by adopting the academic medical care model--patient care provided by physicians who also teach and engage in research. The opportunity for VA physicians to pursue a medical research career as part of their VA responsibilities, and the availability of special research funds to support VA researchers, have enabled the VA to recruit and retain a remarkably talented patient care staff.

By design, the VA's research program is targeted to the support and training of physician investigators. At present the VA supports about one-third of all physician investigators in this country, although the VA research budget is less than 3% of the

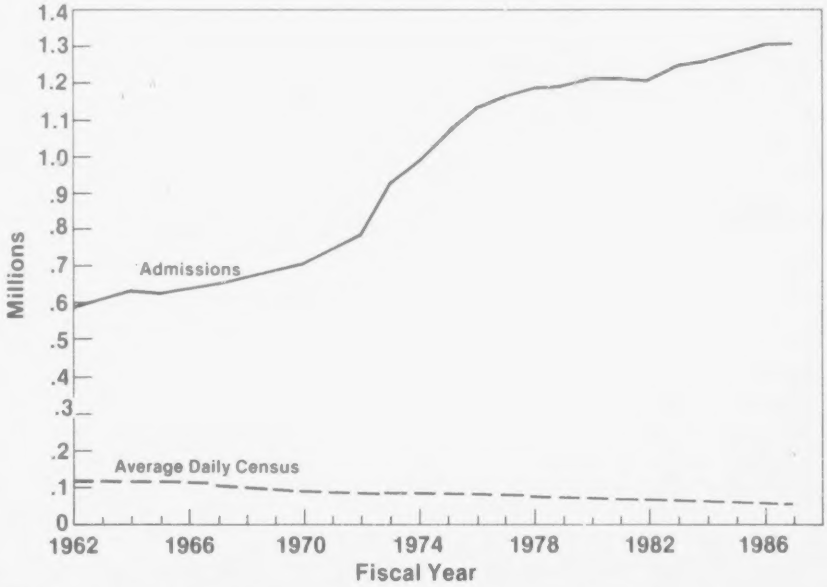

Figure 1. **Average daily census and average number of admissions to Veterans Administration, by fiscal year, 1962-1987.**

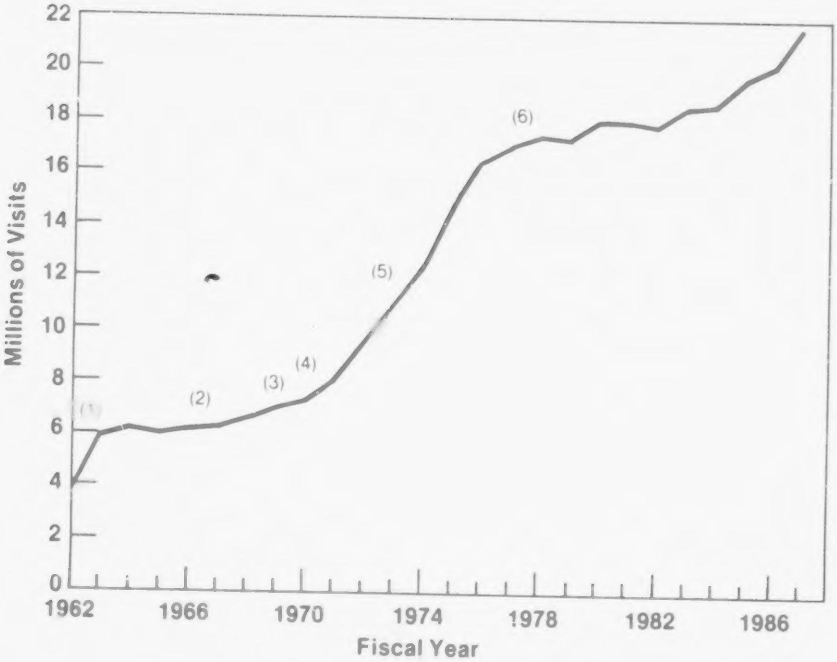

Figure 2. Average number of ambulatory patient visits to Veterans Administration hospitals, by first fiscal year, 1962–1987. The numerals at points along the line indicate when eligibility for VA care was broadened legislatively. (1) Redefinition of outpatient services. (2) Non-service-connected hospitalization for veterans serving after 1/31/55 (PL 89-358). (3) Care of any condition for war veterans totally disabled from service-connected conditions (PL 91-102). (4) Care for veterans receiving aid and attendance allowances or who are permanently housebound; care for non-service-connected disabilities for veterans 65 years of age or older (PL 91-500). (5)Ambulatory care services to veterans eligible for hospital care to obviate need for hospital admission and to veterans with service-connected disabilities rated 80% or more; medical care for certain dependents of veterans with service-connected needs who are totally disabled or who died of service-connected conditions (PL 93-82). (6) Veterans with service-connected disabilities rated 50% or more granted outpatient medical care (PL 94-581).

National Institutes of Health budget. Through the VA's Career Development Program, about 225 young physicians are now in training for research careers. The retention rate of the graduates of this training program is extraordinary—over 48% of all graduates remain in the VA, and another 26% are in non-VA academic positions.

In the late 1940s, the first VA research programs were built around a cooperative research study of the efficacy of streptomycin (and later other chemotherapeutic agents) in the treatment of tuberculosis. That study laid the groundwork for modern multihospital randomized clinical trials. It is significant that 40 years later the VA's Cooperative Studies Program is a major resource for testing the efficacy of antiviral agents in the treatment of acquired immune deficiency syndrome (AIDS) and related diseases.

Although clinical trials are still a significant element of the VA's research program, the majority of VA research support now goes to individual VA scientists through a rigorous peer review system. The program supports investigators in all areas of medicine, from basic science through clinical studies; but, given the VA's emphasis on physician investigators, most VA research has a clinical orientation. The VA's research program is especially strong in the areas of diabetes, immunology, mental health and dementia, infectious disease (including AIDS), geriatrics, endocrinology, and alcohol and drug abuse.

For VA physicians, the opportunity to engage in research makes it possible to participate fully in the academic medical environment. The VA's $200 million research appropriation, coupled with approximately $200 million for investigators' salaries, supports the work of a cadre of VA scientists who in addition attract about $100 million in sponsored support from non-VA sources. This $500 million research effort is a cost-effective investment to assure recruitment and retention of first-quality academic physicians and to contribute to improved diagnostic and treatment capability, not only in the VA but also in the broader medical community.

Recent Developments

The VA operates the largest health care system in the United States and, in fact, in the free world. Its extensive array of affiliations and sharing agreements with academic health centers, community hospitals, and military medical facilities has a significant effect on the practice of medicine in this country. This is especially true for disciplines that most closely relate to the special medical needs of veteran patients. The VA also serves as an element in the safety net for those who cannot afford health care. Almost 45% of the veterans hospitalized in the VA system have no health insurance coverage of any type. This is in contrast to veterans treated in non-VA hospitals, of whom only 7.8% are without insurance.[8]

Under current law, 13 million veterans have categorical entitlement to VA hospital care. Of this number, 47.6%—or 6.2 million persons—are in the low-income category (less than $15,000 per year for single persons; $18,000 if married). The VA thereby

Table 1

Percentage of U.S. Residencies in Each Specialty Supported by the Veterans Administration as of 1 September 1986 and Percentage of Change in the Numbers of U.S. Residencies Supported 1978–79 to 1988–89

Specialty	Percentage Supported 1 September 1986	Percentage Change in No. Supported, 1978-79 to 1988-89
Anesthesiology	7.2	65.9
Dermatology	16.4	−0.5
Family practice	1.1	22.4
General internal medicine	15.0	12.41
Medical specialties	*	7.6
Neurology	22.6	8.5
Nuclear medicine	33.8	5.4
Pathology	12.3	0.1
Physical medicine and rehabilitation	18.8	77.4
Psychiatry	14.4	24.6
Radiology	9.8	1.3
Surgery	11.2	6.1
Surgical specialties	13.0	4.4
Overall	12.2	11.9

*Data not available.

serves as an important source of care for veterans who have low incomes and no insurance coverage. The responsibility the VA accepts in this context removes a significant burden of uncompensated care from the medical community at large. (Comments regarding medically indigent veterans should not be taken to imply that veterans, as a whole, represent lower socioeconomic levels. Compared with their non-veteran counterparts, veterans as a class have attained a higher level of education, have a lower unemployment rate, and earn higher total incomes.)

The VA has contributed significantly to changes in medical education. This is best seen in geriatrics. In the late 1970s, recognition of veteran demographics and the VA's case-mix experience[9] led to significant expansion of the training of medical specialists in geriatrics and gerontology. This VA "geriatric imperative" was a precursor of what became a major health issue facing the entire nation in the mid-1980s.

The VA's responses to the geriatrics issue included research and clinical practice initiatives, as well as educational efforts, in collaboration with academic health centers. These elements are especially well integrated in the VA's unique Geriatrics Research, Education and Clinical Centers (GRECCs). Ten of these centers of excellence in geriatric medicine are now in operation around the country (Bedford/Brockton-West Roxbury, Massachusetts; Durham, North Carolina; Gainesville, Florida; Little Rock, Arkansas; Minneapolis, Minnesota; Palo Alto, California; Seattle/American Lake, Washington; Sepulveda, California; St. Louis, Missouri; and West Los Angeles, California). Two more are awaiting funds for activation this fiscal year (Ann Arbor, Michigan, and San Antonio, Texas).

An additional VA academic approach to the geriatrics imperative began in 1978 with the establishment of a two-year fellowship program designed to develop a cadre of physicians committed to clinical excellence and capable of becoming local and national leaders in geriatrics. The program has been expanded. It now supports 30 new fellows annually at 20 sites, and graduate fellows are in leadership positions both inside and outside the VA system. Building on the success of the fellowship program, the VA established basic residency positions in geriatrics. The first group of 44 geriatrics residents was supported in the 1984-85 academic year, and the program is expected to reach 155 resident positions in academic year 1988-89.

The VA's academic medicine efforts have contributed to significant advances in geriatric medicine and to recognition of geriatrics as a subspecialty of internal medicine and family practice by the Accreditation Council for Graduate Medical Education.

Future Directions

The future of the VA's academic affiliation program will be determined by the extent to which it continues to serve the health care needs of veterans and simultaneously strengthens academic health center programs that directly benefit not only veterans but all citizens. Experience to date demonstrates a strong and continuing base of support for veterans' programs. This was shown again in passage of the cabinet status legislation (Public Law 100-527) by the House of Representatives and by the Senate, both without dissent.

If this support continues, the VA will maintain a stable base of support for undergraduate medical education, residency training, allied health education, preparation of clinical investigators, and the conduct of biomedical research. Program planning in the VA emphasizes these aspects of the affiliation program in the context of medical care needs of veterans.

As an example of such planning, a portion of the VA's academic affairs stipend funds is used as "venture capital," directed toward the development of capabilities in areas of defined need. A prime prospect for such development — through the establishment of fellowships and subsequent resident allocations — is ambulatory care. The VA will launch a new fellowship program in ambulatory care during fiscal year 1989, with the first 11 sites now selected (Bedford, Massachusetts; Brockton/West Roxbury, Massachusetts; Durham, North Carolina; Houston, Texas; Indianapolis, Indiana; Milwaukee, Wisconsin; Minneapolis, Minnesota; Salt Lake City, Utah; San Antonio, Texas; Seattle, Washington; and White River Junction, Vermont). Beginning 1 July 1989, 19 fellows working at postresidency levels will begin two-year fellowships at these centers, primarily in internal medicine settings. Each program involves the VA and its academic affiliate.

Similar special educational emphasis also is being given to fellowships in spinal cord injury, substance abuse, dental geriatrics, and the Robert Wood Johnson Foundation Clinical Scholars and Health Policy Fellowships programs.

Research programs in such areas as AIDS, schizophrenia, and Alzheimer's disease will continue to be major areas for cooperation between the VA and affiliated academic medical institutions. AIDS Research Centers in Baltimore, Durham, Houston, New York, San Diego, and San Francisco are already operating. In the near future a third VA Research Center for Basic and Clinical Studies of Schizophrenia will be designated, joining those at Bronx, New York, and Palo Alto, California, in the effort to expand the amount of multidisciplinary research in that area.

Conclusion

The partnership created by the VA's program of affiliations with schools of medicine and allied health sciences has created a truly national resource. It is a "growth partnership" that is in good health and that continues to evolve to meet the needs of both parties.

Like the G.I. Bill, the VA-medical school affiliation represents a landmark initiative that not only accomplished its immediate purpose of providing the basic benefit of quality medical care to veterans in the post-World War II era but also has continued to serve society for 42 years. New opportunities will be created for this partnership by elevation of the VA to cabinet status and by the growing public awareness that it is essential to strengthen our national commitment to higher education and research. The VA and the academic health centers together contribute to the health and well-being of all Americans through this unique response to President Abraham Lincoln's call, in his Second Inaugural Address, "to care for him who shall have borne the battle, and for his widow and his orphan."

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A Second Survey of Graduates of a Traditionally Black College of Medicine

DAVIS G. JOHNSON, Ph.D., STERLING M. LLOYD, Jr., M.R.P.,
and RUSSELL L. MILLER, M.D.

Abstract—To update and expand upon its 1975-76 survey of 729 graduates of seven classes, Howard University College of Medicine (HUCM) conducted a longer survey in 1985-86 of 1,985 graduates spanning 49 classes. Replies of the 728 respondents to the second survey confirm that HUCM's predominantly black alumni were continuing to provide patient care to a substantial number of poor blacks in urban areas. Fifty-six percent of all HUCM alumni were in primary care, compared with 46% of all alumni of U.S. medical schools who were in primary care. New findings included concerns about malpractice suits and physician impairment. Regarding physician supply in their own communities, 53% of respondents believed that there were too many physicians overall, but 63% believed there were too few black physicians. For the 1940-1969 graduates, loans financed 10% of their medical education, and indebtedness influenced the types of practice chosen by 4%; comparable figures for the 1970-1980 graduates were 25% and 11%. *Acad. Med.* 64 (1989):87-94.

In 1985-86 Howard University College of Medicine (HUCM) conducted a survey of its graduates to learn more about the practice characteristics of the college's alumni and to discover additional ways of improving the college's educational program. The survey was similar to one completed 10 years earlier.[1] While the original survey was limited to the graduates of seven classes and was based on a brief questionnaire, the second survey covered graduates of 49 classes and was based on a longer questionnaire.

Another purpose was to add to the limited information available about the practice patterns of black physicians. Although the second survey included HUCM graduates of all racial backgrounds, 83% of the respondents were black. Additionally, the second survey gave special emphasis to the experiences and opinions of HUCM's women graduates; the details of these findings and a review of research on female physicians are reported separately.[2] Brief preliminary comparisons of the practice patterns of the male and female respondents have been reported in the HUCM alumni newsletter.[3] Finally, it is hoped that this article will encourage other medical schools to conduct similar surveys.

There are two major published reports of the 1975-76 HUCM survey. The primary report[1] includes data about all 311 respondents from the classes of 1955, 1960, 1965, 1970, 1973, 1974, and 1975. The second report[4] focuses on the 252 black respondents and includes comparisons between the earlier (1955-1970) and later (1973-1975) graduates.

Information about graduates, by medical school of graduation, is available in periodic reports provided by the American Medical Association (AMA).[5] These reports, however, are limited to a small number of variables, such as sex, year of graduation, specialty, professional activity, and location. Race is not included as a variable. Some AMA data about all HUCM alumni as of 31 December 1985 are included in tables 1 and 2 of this article.

The general literature about minority-group health providers in the United States is growing but still limited. Approximately 20 references about black U.S. physicians from 1942 to 1976 were cited in our earlier article.[4] Among the most relevant publications on this topic since then are those by Bowman,[6] Koba Associates,[7] Sullivan,[8] Thompson,[9] and Yerby.[10] A 1988 report by Keith and colleagues[11] compared the 1975 black graduates of HUCM and Meharry Medical College School of Medicine with the black graduates of other U.S. medical schools and with nonminority graduates.

Since one aim of this article is to encourage individual medical schools to conduct and report the results of follow-up surveys of their alumni, it is appropriate to note that the literature includes studies by such medical schools as Harvard Medical School,[12] State University of New York-Upstate Medical Center (now called the State University of New York Health Science Center at Syracuse College of Medicine),[13] and the University of Washington School of Med-

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Dr. Johnson is a consultant and Mr. Lloyd is assistant dean for student affairs at the Howard University College of Medicine, Washington, D.C.; Dr. Miller is Howard University's vice president for health affairs.

Correspondence and requests for reprints should be addressed to Mr. Lloyd, Assistant Dean for Student Affairs, Howard University College of Medicine, Washington, D.C. 20059.

Table 1
Numbers and Percentages, by Graduating Classes, of All Living Alumni, of Those Alumni Polled in 1985–86, and of All Respondents and Black Respondents, Howard University College of Medicine

Graduating Classes	All Living Alumni*		1985–86 Survey†					
			Total Polled		Total Respondents		Black Respondents	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Before 1930	73	2.0	3	.2	1	.1	1	.2
1930–1939	171	4.6	6	.3	3	.4	3	.5
1940–1949	398	10.7	80	4.0	35	4.8	33	5.4
1950–1959	590	15.8	153	7.7	61	8.4	57	9.4
1960–1969	803	21.6	757	38.1	290	39.8	243	40.1
1970–1979	1,013	27.2	902	45.4	311	42.7	249	41.1
1980–1985‡	675	18.1	84	4.2	27	3.7	20	3.3
Total	3,723	100.0	1,985	99.9	728	99.9	606	100.0

*Source of data: Eiler, M. A., et al. *Medical Alumni, 1986 Edition.* Chicago, Illinois: American Medical Association, 1987, Table B-7.

The survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, 1955, and 1960–1980 and all living female graduates with known addresses through the class of 1980. Usable responses were returned by 37%. (Some percentages for totals are not exactly 100% because of rounding.)

‡Of these six classes, only the 1980 graduates were polled in the HUCM 1985–86 survey.

icine,[14] all with predominantly white student populations.

National trend data and "Delphi survey" predictions about all graduates of U.S. medical schools from 1950 to 2000 are available in *Physicians in the Making*,[15] which includes a separate chapter on women and minorities. An intensive follow-up of the graduates of 28 U.S. medical schools is available in a comprehensive longitudinal study of the Association of American Medical Colleges,[16] which traced over 1,800 individuals from 1956 to 1976. None of these individuals, however, attended predominantly black medical schools.

Method

With the help of a 13-member advisory committee of alumni, faculty members, and staff members, we developed an eight-page follow-up questionnaire. Although it was similar to the four-page, 26-item questionnaire used 10 years earlier, the 1985–86 version contained 60 items and placed special emphasis on the characteristics and experiences of women graduates.

The first 54 questions, which were directed to all graduates, pertained to background information, post-M.D. education, licensure and certification, geographical information, specialty information, choice of location and specialty, work setting, patient care, and miscellaneous career information. A final question for all graduates invited open-ended comments and suggestions. This was followed by five supplementary questions for women graduates only. (A copy of the questionnaire is available upon request.)

The 1985–86 survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, 1955, and 1960–1980 and all living female graduates with known addresses through the class of 1980. Questionnaires were mailed, along with a cover letter from the dean, in May 1986. Reminder postcards were sent to nonrespondents in early July and duplicate questionnaires were sent in September. The alumni newsletter was used to inform graduates of the study, to solicit the participation of those surveyed, and to provide feedback reports to the respondents and other graduates.[3]

Table 1 shows that a total of 1,985 of the 3,723 living alumni were polled. Usable replies were received from 728 individuals, or 37% of those polled. Although this response rate was lower than the 49% of the 1975–76 survey, the number of respondents (728 versus 361) was over twice as great. The major reason for the lower response rate to the second survey was undoubtedly its greater length.

In addition to the deliberate oversampling of women, the 728 respondents to the 1985–86 survey differed from the 3,723 living alumni in at least the following ways: (1) the respondents were more apt to have graduated in the 1960s and the 1970s (see Table 1); (2) the respondents were more apt to be board certified (65% of respondents versus 39% of all alumni); and (3) the respondents were less apt to be providing primary care (see Table 2).

These differences should be kept in mind in interpreting the results that follow. Although this article emphasizes findings for the total group of 728 respondents, data are also presented in all tables for three subgroups: blacks, earlier (1940–1969) graduates, and later (1970–1980) graduates. Comparative data for all living HUCM alumni are reported in Tables 1 and 2; data for all graduates of U.S. medical schools are also presented in Table 2. To prevent the results of the oversampling of women from distorting the comparisons of the earlier and later graduates, the data for these comparisons are limited to those classes from which both men and women were fully polled.

Results

Of the 728 respondents, 560 (77%) were men. By self-description, 83% were black, 14% white, 2% Asian, and

Table 2
Percentages in Different Specialties of All Living U.S. Medical Graduates and All Living Graduates of Howard University College of Medicine (HUCM) as of 31 December 1985 and Percentages in Different Specialties of Respondents to a Survey of HUCM alumni in 1985–86

	Graduates as of 12/1985		Respondents to 1985-86 Survey‡			
Specialties	All U.S. Schools* ($n = 378{,}453$)	All HUCM Alumni† ($n = 3{,}270$)	Total ($n = 687$)	Black ($n = 573$)	Graduated 1940-1969 ($n = 329$)	Graduated 1970-1980 ($n = 328$)
Individual specialties						
Anesthesiology	3.7	2.3	3.9	3.3	4.6	3.4
Basic medical science	§	§	.3	.3	.6	§
Dermatology	1.6	1.8	2.5	2.6	4.0	1.2
Emergency medicine	2.4	1.6	1.9	1.7	1.2	2.7
Family medicine or general practice	14.1	16.7	12.7	13.6	13.1	12.2
Internal medicine						
General	18.7	18.7	9.2	9.5	8.2	9.5
Subspecialty	4.8	2.9	7.7	7.0	7.9	8.2
Total	23.5	21.6	16.9	16.6	16.1	17.7
Neurology	1.5	.8	.9	.3	1.5	
Obstetrics-gynecology						
General	§	§	8.4	9.4	7.3	10.1
Subspecialty	§	§	4.4	4.5	3.3	5.5
Total	6.3	12.4	12.8	14.0	10.6	15.6
Pathology	2.9	1.2	1.0	.8	.9	1.2
Pediatrics						
General	6.9	7.7	7.6	8.4	4.9	9.1
Subspecialty	.3	.1	1.9	1.7	1.8	1.8
Total	7.2	7.9	9.5	10.1	6.7	10.9
Physical medicine and rehabilitation	.5	.8	1.2	.8	1.5	.6
Psychiatry or child psychiatry	6.8	7.1	8.3	7.7	9.1	6.1
Public health or preventive medicine	.7	1.1	1.3	1.6	.6	1.8
Radiology	5.1	4.3	5.4	5.2	6.7	4.6
Surgery						
General	7.9	8.7	6.1	5.6	5.8	7.0
Ophthalmology	3.5	2.2	2.6	2.1	2.1	3.4
Orthopedic surgery	4.0	3.0	2.5	2.6	4.3	.9
Otolaryngology	1.6	.9	1.3	1.2	1.8	.9
Urology	1.8	1.9	1.5	1.7	1.8	1.2
Other surgical specialty	2.3	1.3	2.9	2.8	3.6	2.4
Total	21.1	18.0	16.9	15.9	19.4	15.8
Other specialty	2.7	2.3	2.9	3.0	2.4	3.0
Combination of specialties	§	§	1.7	1.6	2.1	1.5
Primary care specialties‖	46.0	55.6	42.2	45.5	36.8	46.4

*Source: Eiler, M. A., et al., *Medical Alumni, 1986 Edition.* Chicago, Illinois: American Medical Association, 1987, Tables A-2 and B-7. Numbers exclude 45,888 individuals: 12,100 whose specialties were unspecified; 32,405 who were not in active practice; and 1,383 whose addresses were not known. Numbers for the 1940-1969 graduates exclude 22 women from the classes where the men were not polled.

†Numbers exclude 453 individuals: 216 whose specialties were unspecified, 178 who were not in active practice, and 59 whose addresses were not known.

‡The survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, 1955, and 1960-1980 and all living female graduates with known addresses through class of 1980. Usable responses were returned by 37%. Numbers exclude 6 with no specialty and 35 who gave no response to the question about specialty. Corresponding numbers for black respondents were 4 and 29; for 1940-1969 graduates, 3 and 19; and for 1970-1980 graduates, 2 and 8.

§Data are not available for this category.

‖Primary care defined as family medicine or general practice, general internal medicine, obstetrics-gynecology, and general pediatrics.

1% Hispanic. In terms of age, 24% were 39 years of age or younger, 41% were 40–49, and 35% were 50 or older. Gender and racial self-description data for the three subgroups—blacks, earlier graduates, and later graduates—are included in Table 3.

Fifty-one percent of the respondents had been married while in medical school, and 72% were married by the time they were in their internship or residency. At the time of the survey, 74% were married, 17% were separated, divorced, or widowed, and 9% reported they never had married. Of those with spouses, 15% were married to physicians, 46% to other professionals, 21% to homemakers, 9% to business persons, and the remainder to spouses in other occupations. Parental attitudes toward the respon-

Table 3
Percentages of Respondents with Selected Characteristics, Survey of Alumni of Howard University College of Medicine, 1985–86*

Characteristics	Total Respondents (n = 728)	Black Respondents (n = 606)	Graduated 1940–1969 (n = 350)	Graduated 1970–1980 (n = 338)
Women	23	26	14	24
Racial/ethnic background				
Black	83	100	85	80
White	14	0	11	18
Other	3	0	4	2
Source of school finances				
Self and family	60	58	72	47
Loans	17	18	10	25
Scholarships	21	22	16	27
Other	2	3	3	2
Debts affected career choices				
Location	8	8	4	12
Specialty	5	5	4	6
Type of practice	7	8	4	11
Practice type				
Solo practice	42	44	46	39
Partnership	8	7	8	9
Private group	14	12	15	14
Government	10	11	11	9
Academic health center	10	9	11	9
Military	3	3	2	5
Other	13	14	8	16
Impairment seen as problem				
When in medical school	47	46	34	63
When polled	65	65	63	68
Perception of physician supply in respondents' communities				
Too many total physicians	53	52	56	53
Too few black physicians	63	61	60	66

*The survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, 1955, and 1960–1980 and all living female graduates with known addresses through the class of 1980. Usable responses were returned by 37%.

dents' becoming physicians were reported as generally favorable; more mothers (87%) than fathers (79%) had positively supported that career goal.

Training and Licensure

All but one respondent had completed an internship (first year of graduate medical education), and 92% had completed at least one additional year of residency training. Almost two-fifths of the respondents (38%) had received formal postgraduate fellowships or traineeships. Original licensure as a physician was on the basis of national board examinations for 46%, state board examinations for 40%, and the Federation Licensing Examination (FLEX) for the remaining 14%. Sixty-five percent of the respondents reported having specialty board certification.

Specialty Choice

As detailed in Table 2, over two-fifths (42%) of all the respondents were in a primary care specialty, with 13% in family medicine–general practice, 13% in obstetrics-gynecology, 9% in general internal medicine, and 8% in general pediatrics. Other popular specialties were surgery (17%), psychiatry (8%), and internal medicine subspecialties (8%). Of the 573 black respondents with known specialties, 46% were in primary care, a percentage slightly higher than that for all respondents. More of the 1970–1980 graduates than the 1940–1969 graduates (46% versus 37%) were in primary care.

Comparison of the specialty distributions in 1985 of all U.S.[5] and all HUCM graduates (see columns 1 and 2 of Table 2) reveals close similarities in most fields. The HUCM alumni, however, were substantially overrepresented in obstetrics-gynecology (12% of HUCM graduates versus 6% of all graduates), slightly overrepresented in family practice–general practice (17% versus 14%), and slightly underrepresented in internal medicine (22% versus 24%) and surgery (18% versus 21%).

Seventeen percent of the respondents reported having made substantial changes in specialization during their medical careers, and 91% were satisfied with their current specialties. In addition, 23%, including many in obstetrics-gynecology, reported changing the nature of their medical practices because of actual or threatened malpractice suits, rising costs of malpractice insurance, or both. These changes included moves to salaried positions, more screening of new patients, more tests, and more complete records. Other reasons for specialty changes besides malpractice considerations were the search for more challenging work and the more predictable hours found in such fields as emergency medicine.

The most influential factors in the respondents' choices of their medical specialties included their interests (important to 86%), the intellectual challenge of the specialty (82%), the respondents' abilities (77%), the desire to serve a particular group of people (57%), financial considerations (57%), and working hours (57%). Among the least important factors were influence of classmates (20%), influence of spouse (25%), influence of house staff (31%), and preceptorship experiences (35%).

Practice Location

The most influential factors in the respondents' choices of their geographical locations included preference for a specific region of the country (important to 85% of the respondents), the general characteristics of the community (important to 78%), financial considerations (69%), desire to serve a particular group of people (67%), professional ties or contacts in the community (64%), best available opening (61%), and influence of spouse (47%). The least important factors were influence of classmates (important to 16%), influence of house staff (17%), preceptorship experience (20%), influence of faculty (22%), and recruitment by community (32%).

As shown in Table 4, approximately 60% of respondents practiced in or near large cities, with 27% of the total and 30% of the blacks working in the "inner city," or "ghetto," areas. Twelve percent of the later graduates worked in small cities, compared with 7% of the earlier graduates. Two-fifths of all the respondents (37%) had made substantial changes (of 50 miles or more) in the geographical locations of their practice sites, and 91% were satisfied with their practice locations at the time of the survey.

Professional Activities

Of time devoted by the respondents to professional activities, 75% was spent in patient care (69% in direct care, and 6% in indirect care, such as radiology), 11% in administration, 7% in teaching, 3% in nonmedical work, 2% in research, and 1% in other medical care. Although not directly comparable, the percentage of time devoted to patient care (75%) reported by the survey respondents was similar to the proportion (82%) devoted to such care by all HUCM alumni and by all U.S. medical school alumni whose major professional activity, as reported to the AMA,[5] was patient care.

Practice Type

Sixty-four percent of the respondents worked primarily in private practice, as shown in Table 3. This percentage comprised 42% in solo practice, 8% in partnership, and 14% in private group practice. Ten percent were in nonmilitary government service (7.5% state or local and 2.8% federal). Ten percent worked in academic health centers, 3% in the military, and 13% in other settings (4% in prepaid group practices, 3% in community health facilities, less than 1% in industry, and 5.5% in other medical environments).

Eleven percent of all respondents were employed by a health maintenance organization, but only half were on a full-time basis. Forty-two percent reported having a medical school appointment, with about 10% (72 of 728) being full-time faculty members.

Physician Supply

When asked their opinions about the overall supply of physicians in their communities, 53% of the respondents believed there were too many, 41% believed the supply was about right, and 6% felt there were too few. In considering the local physician supply in their specialties, 37% of the respondents felt there were too many, 50% felt the number was about right, and 13% felt there were too few. Regarding the supply of black physicians in their communities, only 7% of the respondents believed there were too many; 31% believed the

Table 4
Percentages of Respondents with Practices in Different-sized Communities, Survey of Alumni of Howard University College of Medicine, 1985–86*

Communities	Total Respondents ($n = 681$)	Black Respondents ($n = 569$)	Graduated 1940–1969 ($n = 324$)	Graduated 1970–1980 ($n = 323$)
Large city (500,000 or more)				
Inner city/ghetto	27	30	30	24
Other city area	23	23	24	21
Suburb	10	8	8	12
Total	60	61	62	57
Moderate size city (50,000–500,000)	27	27	27	26
Small city (10,000–50,000)	9	8	7	12
Small town (less than 10,000)	3	2	3	3
Rural area	1	1	1	1
Other	2	2	1	2

*The survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, and 1960–1980 and all living female graduates with known addresses through the class of 1980. Usable responses were returned by 37%. Data in the table are limited to those individuals who responded to the question about location of practice. Numbers for the 1940–1969 graduates exclude 22 women from the classes where the men were not polled.

number was about right, and 63% believed there were too few. In considering their communities' supply of other minority physicians (for example, Hispanic and Asian physicians), 22% believed there were too many, 37% felt the number was about right, and 40% felt that it was too low. Comparable findings for the subgroups of black, earlier-graduate, and later-graduate respondents appear in Table 3.

Patient Characteristics

Among all respondents, 93% were providing medical care to patients, devoting a mean of 48 hours per week to this activity. Of their patients, over three-fifths (63%) were women, as shown in Table 5. Fifty-seven percent of their patients were black, 31% white, 9% Hispanic, and 3% of other races. Nearly half (49%) of their patients were 20–59 years of age, with the rest being evenly divided between those under 25 years of age (25%) and those 60 or over (26%). Recent graduates cared for a slightly higher proportion of white patients than did earlier graduates (33% versus 29%).

In terms of economic status, the respondents considered that 12% of their patients were well-to-do, 23% were comfortably well off, 31% were average, 17% were not very well off, and 18% were very poor. Patients of the black and the more recent graduate subgroups were reported as having a slightly lower economic status than that of patients for all 728 respondents. For all the respondents in private practice, 21% of their patients had their care financed primarily by Medicaid and 19% by Medicare. Most of their other patients were financed primarily by private insurance (32%) or from their own funds (19%).

Medical School Finances and Career Choices

Although the majority of the respondents' medical school financing had come from their families (30%), their own earnings and savings (25%), or their spouses' earnings (5%), a substantial portion also came from legally repayable loans (17%), service-obligated scholarships (12%), and non–service-obligated scholarships (9%). Educational debts played a significant role in the career choices of 8% of all respondents. As shown in Table 3, debts played a relatively larger role in the career choices of the 1970–1980 graduates than in those of the 1940–1969 graduates.

Career Motivation

When asked what proportion of their current motivation for working as a physician came from each of four specified sources, the respondents as a group reported that less than half was financial (43% to support one's self or family and 2% to supplement family income). The respondents as a group reported that more than half of their motivation was psychological, almost equally divided between serving others (26%) and deriving personal satisfaction from their work (29%).

Concerns about Impairment

The respondents indicated significant concern about medical student and physician impairment from drugs and alcohol. While in medical school, only 47% of all the respondents had be-

Table 5

Percentages of Respondents' Patients with Selected Characteristics, Survey of Alumni of Howard University College of Medicine, 1985–86*

Patient Characteristics	Total Respondents ($n = 728$)	Black Respondents ($n = 606$)	Graduated 1940–1969 ($n = 350$)	Graduated 1970–1980 ($n = 338$)
Sex				
Male	38	36	39	37
Female	63	64	61	64
Race/ethnicity				
Black	57	64	59	55
White	31	24	29	33
Hispanic	9	9	9	10
Other	3	3	2	3
Age				
Under 20	25	26	22	26
20–59	49	50	51	48
60 or over	26	24	28	25
Economic status†				
Well-to-do	12	10	13	10
Comfortably well off	23	23	24	21
Average	31	30	31	32
Not very well off	17	17	16	18
Very poor	18	19	17	18

*The survey covered all living male graduates with known addresses in the classes of 1940, 1945, 1950, 1955, and 1960–1980 and all living female graduates with known addresses through the class of 1980. Usable responses were returned by 37%. (Some percentages for totals are not exactly 100% because of rounding.)

†Status of patients as estimated by respondents.

lieved this to be a problem and only 3% had thought it a major problem. At the time of the survey, however, 65% believed it to be a problem, with 14% citing it as of major significance. Almost all (94%) believed there should be formal programs in medical schools to combat student and physician impairment, with 47% believing there is a major need for such programs. Only 34% of the 1940-1969 graduates had perceived physician impairment as a problem while they were in school, but 63% of them had perceived it as a problem at the time of the survey. Comparable findings for the 1970-1980 graduates were 63% and 68%.

Comments and Suggestions

A total of 176 (24%) of the respondents offered open-ended comments about their experiences as HUCM students and graduates and suggestions regarding how HUCM could educate its students better. As in our 1975-76 survey, the most frequent comment was that the College of Medicine should better prepare its graduates for the business side of medical practice. Several suggested that the college add instruction in medical jurisprudence and the organization of medical practice, including health maintenance organizations and preferred provider organizations.

Some commented on the excellent quality of instruction and mentoring provided by faculty members, while others made suggestions regarding the improvement of faculty-student relationships. Still others added comments regarding how to improve the curriculum and how to prepare students better for licensure examinations. Another frequent suggestion was that there be more counseling on the selection of residency, specialty, and practice locations. Many respondents expressed appreciation for the medical education afforded them by the College of Medicine and thanked the college for its excellent preparation.

Discussion

Like the respondents of the 1975-76 survey, approximately 60% of the 1985-86 respondents practiced in large urban areas, with almost 30% of them working in the inner city. Few had established their careers in small towns and even fewer in rural areas. Compared with graduates of other U.S. medical schools, a higher proportion of the HUCM alumni were in the primary care fields of family practice, general internal medicine, general pediatrics, and obstetrics-gynecology. Howard graduates also tended to be highly overrepresented in the field of obstetrics-gynecology, slightly overrepresented in family medicine, and slightly underrepresented in internal medicine and surgery.

The factors that most influenced the graduates' practice locations and specialty choices appear to have been external to their training experience and were closely related to their individual preferences and abilities. As in the 1975-76 study, the desire to serve a particular group of people — for instance, blacks — and preference for a specific region of the country were among the most influential factors in choosing both location and specialty. New questions asked in the 1985-86 survey, however, revealed that the respondents' interests were also very influential. About nine of 10 were satisfied with their locations and specialty choices. Personal satisfaction and service to others combined to outrank financial considerations as the motivation for working as a physician.

The data indicate that most Howard graduates were delivering patient care and working in diverse settings. The dominant mode of practice reported by these alumni, however, remained private practice. Three of every five of the respondents' patients were female. Blacks constituted 57% of the respondents' patients — down from the 65% reported by respondents in our 1975-76 survey. It appears that HUCM graduates have growing numbers of Hispanic and other minority patients (from 6% reported in the 1970s to 12% reported in the present survey); the reported percentage of white patients increased only 1%, from 30% to 31%.

There was a slight growth in the proportion of patients 60 years old or older, from 21% in 1975-76 to 26% in 1985-86. Although this rise may have been seen partly because more older physicians were polled in the later survey, it may also reflect the general aging of the American population.

The Howard medical alumni continued to see patients from a wide spectrum of family income levels. Although fully a third of their patients were poor or very poor, almost another third had average incomes, and the remaining third were above average to very well off. The black alumni served patients from a slightly lower socioeconomic status. Medicaid and Medicare combined to account for significantly less than half of the patient care financing for those respondents in private practice; private financing accounted for about half of all patient care income.

A little more than half of the respondents agreed with federal government estimates[17] of a physician oversupply, but less than 10% thought there were too many black physicians. Those who did think so may be black alumni who face economic competition from other black physicians in certain sections of cities, such as Washington, D.C., that have sizable populations of black physicians. A slightly higher proportion of the 1970-1980 graduates than of 1940-1969 graduates believed that there were too few black physicians. One possible explanation of this difference is that the younger alumni attended undergraduate and medical school during the civil rights movement, when the shortage of black physicians was strongly emphasized. A surprising 22% of all respondents thought there were too many physicians from other minority groups. Perhaps these are alumni who face economic competition from the growing Asian medical community.

Most respondents had not changed their medical practices in response to medical malpractice suits or threatened suits, but a substantial number had — especially in obstetrics-gynecology. Two-thirds of all respondents thought that physician impairment was a problem today, and almost all thought that attention to the problem should be given in the medical school curriculum. These findings support medical school efforts to place greater emphasis on the topics of medical malpractice and physician impairment.

Sixty percent of the funds needed to finance the respondents' medical education had been derived from family resources or self-earnings. It appears that the educational debt of most respondents was relatively small. Most Howard medical students today, however, depend heavily on loans to finance their education. Moreover, comparative data suggest an increasing relationship between medical school indebtedness and career choice. Whereas only 10% of the medical school financing of the 1940–1969 graduates came from legally repayable loans, this was true for 25% of the financing of the 1970–1980 graduates. Similarly, only 4% of the earlier graduates reported that their educational debts significantly affected their choices of practice location, specialty, or type of practice, whereas comparable figures for the later graduates were 12% for location, 6% for specialty, and 11% for type of practice. Thus, both the portion of medical education financed by loans and the portion of those whose practice decisions were influenced by this debt were two and one-half times greater for the later graduates.

Most respondents reported career encouragement from both mothers and fathers. This finding, coupled with the finding that 30% of their medical education financing came from family resources, suggests that Howard medical students have had significant family support of their career aspirations.

Conclusion

Howard medical alumni are providing patient care to substantial numbers of poor blacks in urban areas. This patient care is in accord with current federal health policy priorities aimed at addressing the problem of inadequate health care for the poor and minority populations of this nation. The alumni are also serving significant numbers of whites and Hispanics, however. Their practices include individuals from all income strata. Although significant numbers are in primary care private practices, HUCM alumni are a diverse group and can be found in all specialties and in a variety of settings, including private offices, academic medical centers, research institutions, military installations, community health centers, and health maintenance organizations, and in governmental agencies throughout this country and, indeed, in many parts of the world. These findings are consistent with those of the 1975–76 survey and with the goals of the institution.

We hope that this article will add to the limited body of knowledge about the characteristics of alumni of a predominantly black medical school as compared with those of alumni of other U.S. medical schools. Given that 83% of the survey respondents were black, the study provides unique data about the practice patterns of black physicians. In addition, the comparative data about the earlier and later HUCM graduates may suggest fruitful directions for further research at individual schools and nationally.

The authors acknowledge with gratitude the cooperation of the Howard University Medical Alumni Association, Inc., in providing the mailing addresses for the study sample.

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Financing Graduate Medical Education in Family Medicine

JACK M. COLWILL, M.D.

Abstract—Family practice residency programs differ fiscally from residency programs in most other specialties because they have limited income-generating potential. The present review demonstrates that the typical family practice residency program has been fiscally solvent as a result of receiving approximately one-third of its income from state and federal appropriations. The level of such support plateaued in the 1980s and programs have not continued to expand despite an ongoing shortage of family physicians. Today, declining Medicare payments to hospitals threaten hospitals' contributions to family practice residency programs. The ability of family practice residency programs to meet the continuing need for family physicians will depend upon the development of specific state and federal policies that provide fiscal incentives to maintain and expand family practice residencies. *Acad. Med.* 64(1989):154–158.

Maintaining adequate funding for U.S. graduate medical education is a growing national concern, particularly for those in family practice. The development of family practice residencies in the 1970s depended upon the recognition by funding sources that these programs had limited revenue-generating potential. Professional fees from primary care services are limited when compared with those from more procedurally oriented services. Further, the ambulatory family practice center, compared with other hospital revenue producers, contributes only modestly to the gross revenues of the teaching hospital. Consequently, funding for family practice residency programs has been heavily dependent upon governmental support to augment the typical sources of funding in graduate medical education, such as the hospital and professional fees.

Several studies have examined the direct costs and sources of funding for family practice residency programs. The present paper represents a review of those data, demonstrates why family practice funding is different from that of inpatient-oriented specialties, and addresses issues of future funding of graduate education that are of particular relevance to family medicine.

Features of Family Practice Residencies

With the establishment of the American Board of Family Practice in 1969, family practice became the twentieth medical specialty. Subsequently, state and federal support catalyzed the explosive development of family practice residency programs. The number of accredited programs peaked in 1980 at 385, then dropped to 381 by July 1988; the total number of residents reached 7,486 in 1984 and then dropped to 7,279 in 1988.[1] Today 12% of all first-year residency positions are offered in family practice.[2]

Dr. Colwill is professor and chairman, Department of Family and Community Medicine, University of Missouri–Columbia School of Medicine, Columbia.

Correspondence and reprint requests should be sent to Dr. Colwill, University of Missouri–Columbia School of Medicine, Department of Family and Community Medicine, M228 Medical Science Building, Columbia, MO 65212.

While training in most other specialties is based primarily on hospital inpatient wards, over half of each family practice resident's experience is in ambulatory medicine. Two-thirds of a family practice resident's experience in the ambulatory setting is acquired providing longitudinal care for patients in a family practice center. In addition, other medical disciplines contribute to the education of a family physician; typically, over half of a resident's time is spent on rotations with faculty members in other disciplines, in both ambulatory and inpatient settings.

The typical residency program is relatively small, adding six residents annually to a three-year program. Although residencies in most specialties are based in large teaching hospitals, most residencies in family medicine are located in community hospitals. In half of these community hospitals, family practice represents the only residency program. Even so, most programs are associated with medical schools. In 1988, 33% were operated directly by a medical school, and an additional 55% were affiliated with one; 15 programs were based with the armed forces.[1]

Thus, family practice residency programs differ from the inpatient-oriented specialties by their heavy emphasis on ambulatory care, their maintenance of primary-care continuity practices, their rotations in other disciplines, and their tendency to be located in community hospitals where few other residency programs are located.

Sources and Uses of Funds

Three national surveys have reviewed the costs and revenues of family practice residency programs. These surveys had remarkably consistent results despite the inherent methodological difficulties imposed by different accounting methods, classification errors, and other variables. These surveys were the University of Wyoming study of 1975,[3] the University of Minnesota study of 1981–82,[4] and the University of Oklahoma study of 1982–83.[5] Each surveyed all the residency programs in the United States and obtained usable responses from approximately 40% of them.

The most recent study, from the University of Oklahoma, obtained data from 158 programs. These programs were similar to all family practice residencies in terms of six demographic variables. The investigators used extensive pretesting of the questionnaire and provided assistance to respondents in an effort to reduce misclassification errors. Inasmuch as education and patient-care activities are intertwined, these data represent the combined costs of providing education and patient care.

The direct expenditures of these 158 family practice residencies were divided almost equally among resident stipend costs, family practice center costs, and faculty and administrative costs (as shown in Table 1). The median program cost per resident per year was $72,093, and the mean cost was $79,058. These figures represent only direct expenditures, such as salaries, fringe benefits, malpractice insurance, and mortgage payments. Indirect costs, principally those allocated by a hospital to the family practice center or program, were not included. Many family practice centers were freestanding centers —organizationally, fiscally, and administratively separate from the teaching hospital. The majority, however, were components of hospitals.

Table 2 lists sources of operating revenue for the 158 programs. The median and mean revenues per program were $70,223 and $80,559 per resident per year, respectively. Not all programs reported revenue from each source. Consequently, the calculation of the median and mean for a particular source of revenue was calculated based upon the number of programs reporting revenue from that source. Revenue from sources specifically identified with responsibilities other than residency training (for example, medical student education or research) was excluded.

Hospital support, the largest single source of revenue for the 158 programs as a group, provided a median of $27,965 per resident. Some programs did not report any hospital support. However, this apparent lack of hospital support is probably an artifact of the programs' accounting systems. For some programs, hospital support may have been identified as "non-program-managed revenues," which were defined as sources of funding that did not flow through the program's own accounting system.

Professional fees for services rendered by family practice residents and faculty provided the second-largest source of operating revenue; $22,911 was the median collected. Professional fees that residents assisted in generating while on rotations on other specialty services accrued to those specialties.

The third major source of support was state government. Two-thirds of the programs reported receiving a median of $15,925 of state funds per resident. State funding for family practice residency education was provided in several ways. Some states provided direct line appropriations for residencies to a university or to a manpower authority, such as an area health education center. Others included family practice funding under the overall

Table 1

Mean and Median Expenditures of 158 U.S. Family Medicine Residency Programs in 1982–83*

	Median	Mean
Resident costs	$24,234	$27,918
Faculty costs	19,334	22,955
Administrative costs (n = 118)†	3,876	6,704
Family practice center	23,996	27,219
Total program costs	72,093	79,058

*Modified from C. N. Ramsey et al., *A National Study of Financing of Family Practice Residency Training Programs* (Oklahoma City, Oklahoma: University of Oklahoma, 1985).

†Only 118 respondents provided information on administrative costs.

Table 2

Sources of and Total Operating Revenues for 158 Family Practice Residency Training Programs, 1982–83*

Source/Total Sources	Number of Programs Reporting	Revenue per Resident per Year	
		Median	Mean
Hospital support	105	$27,965	$34,397
Patient care revenue	142	22,911	27,467
State support	105	15,925	22,780
Non-program-managed support	49	16,526	18,767
Other institutional support†	25	7,163	20,761
Grant support	82	5,776	8,971
Other support	43	1,142	6,992
Philanthropic support	24	909	9,138
Interest and investment income	33	372	2,450
Local governmental support	11	10,856	12,328
Total revenue	158	70,223	80,559

*Modified from C. N. Ramsey et al., *A National Study of Family Practice Residency Training Programs* (Oklahoma City, Oklahoma: University of Oklahoma, 1985).

†Excludes hospital and government support.

umbrella of appropriations to a university or medical school. Data from the American Academy of Family Physicians (AAFP) show that 40 states had legislation dealing with family practice education.[6] Because of variations in means of funding, it is difficult to obtain accurate longitudinal data on state funding of residencies. The AAFP data, however, demonstrate that state funding plateaued in the 1980s and, indeed, has decreased in some states.

Federal training grants have been a relatively small but highly important source for funding family medicine residency education. Such grants initially catalyzed development and now provide operational support. These grants provided under Section 786 of Title VII reached $40.5 million in 1978 but declined to $37 million in 1987. Thus, considering inflation, these funds have decreased markedly. Despite this drop, over half of the programs in the Oklahoma study were receiving grant support—largely from the federal training grants. For these programs, the median revenue from grants was $5,776 per resident per year.

Thus, most income accruing to the family practice residency programs surveyed in the Oklahoma study came from three sources: hospital revenues, professional fees, and governmental funding. The three sources provided funds roughly comparable in magnitude.

Unique Funding Problems

One might ask why funding of graduate education in family medicine is so dependent upon governmental support and why it is so different in this regard from graduate education in other medical specialties. In most specialties residency education is funded from hospital income and professional fees.[7] Overall, hospitals provide 80% of these residents' stipends and also provide the in-hospital milieu—that is, hospital wards, operating rooms, and intensive care units. Faculty salaries are derived both from professional fees and from hospital revenues.

Differences between the financing of residency education in family practice and that in traditional specialties lie primarily in the relative abilities of those programs to generate patient-care revenue, both as professional fees and as hospital revenue through admissions. Costs of family practice residencies are probably lower than those of other specialties: faculty salaries tend to be lower, and the specialty is less dependent upon technology. The cost of operating a family practice center, one-third of program cost, is not large when compared with the costs of facilities required for other residencies such as operating rooms, radiology suites, and intensive care units. On the other hand, the income from the family practice center is limited when compared with that of the operating room and may not be essential to the operation of the hospital. Thus, the center, if funded by the hospital, tends to be a "loss leader" for the hospital, and its fiscal reason for existence lies in the degree to which it provides admissions for the hospital.

The Department of Family and Community Medicine at the University of Missouri–Columbia School of Medicine has maintained a record of the fiscal impact of patient referrals from the family practice center to the university's hospitals and clinics. Each patient visit to the family practice center in 1986 yielded an average of $27 in professional charges by family physicians, $29 in professional charges by faculty in other departments for patient consultation or referral, and $163 in charges by the hospital for inpatient care and ancillary services. These hospital charges represent a significant contribution to that hospital but nevertheless were only 3% of the hospital's gross charges. Offsetting those charges, the hospital incurred the marginal costs of providing hospital and ancillary services for those patients, plus the $400,000 overhead cost of the family practice center.

The 20,000 clinic visits of the Columbia practice center represent a practice equivalent to that of four active family physicians. Purely from a fiscal standpoint, the hospital might find that marketing, maintaining good relationships with referring physicians, or establishing nonteaching satellite clinics would be a more cost-effective way to obtain referrals than would be investment in a family practice residency. In the past, Medicare educational cost reimbursement has made the situation viable. However, major additional hospital support to expand family practice residencies or to replace declining governmental support is not a realistic expectation when one takes into consideration tightening third-party reimbursement, competing demands for funding new technology, the expansion of other residency programs to meet hospital service needs, and the enhancement of other hospital services.

Recognizing the limited potential for increased support from the hospital, what is the potential of professional fees to support the residency? Revenue from professional services is a critically important source for meeting the cost of graduate medical education in all specialties. The family practice residencies participating in the Oklahoma study had median revenue from professional fees of $22,911 per resident per year, approximately one-third of the total program costs. Comparable data on professional fees by residencies in other specialties have not been published. However, in 1986-87 at the University of Missouri Hospital and Clinics (UMHC), revenue from professional fees by faculty was 2.8 times greater per resident for pediatrics, 3.2 times greater for internal medicine, and 5.7 times greater than that for family practice. The family practice department's professional fees per resident at the UMHC were not low by national standards and exceeded the mean for such fees in the Oklahoma study. The greater revenues per resident by the departments of pediatrics, medicine, and surgery occurred as a result of the inpatient and procedural orientations of these disciplines and their subspecialties. Although the data reported in that study were derived from only one institution, they probably are broadly representative and demonstrate the discrepancy in professional revenues between family practice residencies and inpatient-based residencies.

In a 1981 study, Colwill and Glenn[8] built a hypothetical model of family practice residency education in order to ascertain the degree to which program costs might be met through professional charges for patient care. This model used residency review-committee criteria to define the minimal ratio of faculty to residents and the maximum numbers of patient visits per resident. The paper assumed a clinic overhead rate of 50% of gross charges, fees based on community levels, a collection rate of 85% of gross charges, and 1,500 visits per resident per year — exceeding by 400 visits per year the 1,105 visits found in the Oklahoma study. Even with these unrealistically optimistic assumptions, only 50% of program costs could in theory be met by revenues from the care of the family practice patients. Thus, in the current climate of reimbursement, it is unlikely that professional patient care revenue will fund a significantly higher proportion of residency program costs than the third it now funds.

One might assume that the primary care portions of residencies in internal medicine and pediatrics would face similar fiscal problems resulting from this limited potential for generating professional fees. However, a recent study by Kosecoff and colleagues[9] of 15 residency-based group practices in general internal medicine at teaching hospitals suggests that these group practices were financially self-sufficient despite the fact that they had educational costs and served disadvantaged populations. On the surface, these findings appear to be at variance with those of other studies reported here. This may not be the case, however. Program costs in the Kosecoff study of internal medicine clinics addressed only residency training costs associated with time spent in the clinic and not the full administrative costs of the program. Supply costs and other operational support costs (such as telephone service), which in the University of Missouri practices equalled 25% of nonphysician clinic overhead costs, were not included. Furthermore, professional charges in the internal medicine clinics were higher than prevailing fees in their communities. The community settings of most family practice centers make it unlikely that they could succeed if they charged fees above the prevailing community levels.

Policy Implications

The number of residency positions in family practice has plateaued at a time when manpower planners believe that a higher proportion of medical school graduates should be prepared for primary care careers.[10,11] The congressionally mandated Council on Graduate Medical Education reported a shortage of family physicians.[11] At the same time, the council perceived a probable overall surplus in the total number of physicians. Managed-care organizations increasingly are seeking physicians with specific preparation in primary care. The American Academy of Family Physicians has long urged further expansion in family practice residency education. Its goal has been to have 25% of U.S. medical school graduates enter family medicine. Family physicians are also more likely to meet the needs of rural communities. In 1986 they chose rural practices (that is, in areas other than standard metropolitan statistical areas) three times as often as physicians in other specialties, in aggregate.[12]

The major reasons for the plateau in the number of residency positions in family practice are the leveling of government support and the family practice programs' limited income-producing potential. The number of applicants has not thus far been a limiting factor, for well over 90% of residency positions have consistently been filled — even following the decline in those positions matched through the National Residency Matching Program in 1988.[1]

The specialty distribution of residents within teaching hospitals is determined more by the service needs of the institution than as a response to societal needs. Residents provide valuable services for the institutions while they obtain an education. From a fiscal standpoint it may make more sense for the hospital to employ a resident in anesthesiology than one in family practice. A resident in anesthesiology can provide service in the operating room — a major profit center — and save the hospital the cost of a nurse anesthetist. At the same time, the hospital obtains direct and indirect Medicare educational reimbursements for the services of the resident. In contrast, 50% of the family practice resident's time is in the "loss leader" ambulatory setting.

In the ambulatory setting Medicare direct educational reimbursement is less than on the inpatient wards because patients are younger and therefore a smaller proportion are Medicare recipients. Furthermore, Medicare direct educational cost reimbursement in the ambulatory setting is set at 80%, while on the inpatient wards it provides 100% reimbursement.

Congress now has made major reductions in Medicare payments for graduate medical education. Direct educational cost reimbursement will now be tied to an institution-specific cost per resident that will be retroactive to the 1984 federal fiscal year. This figure is to be updated annually by the consumer price index. Furthermore, the indirect educational cost reimbursement rate has been reduced by one-third, and further reductions are being considered. Estimated indirect payments for fiscal 1988 amount to two billion dollars, twice the level of direct payments.

The impacts of these reductions have yet to be felt. However, it is safe to assume that most teaching hospitals will reassess their commitments to graduate medical education. For many community hospitals, the promise of increased numbers of admissions from family practice residency graduates will justify maintenance of the residency program. For many other teaching hospitals it may be more important to support the major hospital revenue-generating centers through maintenance of residencies in other specialties. Thus, reductions in Medicare educational payments to the hospital are likely to be followed by disproportionate reductions of residency programs in family practice.

During the 1970s state legislatures and Congress recognized the societal need for family physicians to address both the shortage of primary physicians and the need for rural physicians. Programs are fulfilling these needs but are in financial jeopardy because their long-term funding needs have not been fully recognized. Maintenance and expansion of programs are highly dependent upon the understanding that the financing needs of family practice residencies are different from those of inpatient-oriented residency programs in other specialties. This has been recognized by the Institute of Medicine report of 1978,[13] the Graduate Education National Advisory Committee report of 1980,[14] and the report of the Council on Graduate Medical Education of 1988.[11]

Both Congress and state legislatures must review and reestablish policies for training of family physicians —especially in light of decreasing Medicare support of graduate medical education. A reasonable funding objective would be for the residency and its sponsoring hospital to generate two-thirds of the total cost of a family practice residency. The remaining third must come from state and federal sources that are increased to compensate for the inflationary trends of the 1980s and decreasing Medicare support. A counterbalance is needed to hospitals' tendencies to disproportionately reduce family practice residencies because of Medicare reductions. This could be accomplished by Congress' proportionately increasing Medicare educational payments for specialties in short supply in relation to specialties that are in surplus.

A significant increase in residency positions in family practice will require additional direct funding. This might be accomplished through expansion of the current training grant authority under Title VII, Section 786. However, because of their competing nature and lack of inflationary funding increases, these grants have not provided the program stability that would occur through more predictable funding. Federal capitation support or matching grants to states have the potential to provide incentives for both maintenance and expansion of residencies in family practice, but only if funded adequately. These options should be explored.

In the final analysis, so long as primary care services are reimbursed at current levels, maintaining and expanding family practice residencies will depend upon the degree to which government support is available to assist in meeting increased program costs.

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RESEARCH REPORTS

ARTICLES

Sex Differences in Rank Attainment among Radiology and Internal Medicine Faculty

THOMAS H. DIAL, Ph.D., JANET BICKEL, M.A., and ANN M. LEWICKI, M.D.

Abstract—Overall, the percentage of women attaining the ranks of associate professor and professor remains well below the percentage of men in those ranks. Few studies of women in academic medicine have been conducted that might guide the leaders of medical schools and specialty societies in addressing the reasons for this disparity. The Association of American Medical Colleges (AAMC) Faculty Roster System allows comparison of a cohort of faculty at any selected time following their first faculty appointments. This study examined men and women faculty who received their first appointments in the departments of radiology and internal medicine in 1976 and who were still active in 1986. Disparities between men and women in rank attained were apparent in both specialties but were greater in radiology than in internal medicine. Other variables examined include ethnic-racial self-description and teaching, research, patient care, and administrative responsibilities. The authors pose additional research questions requiring information that the Faculty Roster System is not designed to provide. *Acad. Med.* 64(1989):198–202.

The increasing number of women graduating from medical school—which went from 700 in 1970 to 5,100 in 1987—is changing the composition of U.S. medical school faculties. In 1988 women held 19.3% of all full-time faculty positions (constituting 15.7% of all faculty that year with the M.D. degree and 21.4% of all those with other doctorates), up from 13.3% in 1968.[1] However, after rising from 4.8% in 1975 to 9.4% in 1986, the proportion of women who have attained the rank of professor has remained at 9.4%.[2] As Table 1 shows, the percentages of women at the ranks of associate professor and professor remain well below the percentages of men in these ranks.

A survey of the faculties of diagnostic radiology departments revealed a profile similar to that shown in Table 1, with more women than men having the lower ranks (60% of men but only 29% of women were associate or full professors).[3] The same study found that women faculty published less and had less grant support than their male counterparts, but it found no sex differences in the percentages who were board certified, the average ages at the end of residency, or the hours spent teaching each week.

A study of academic anesthesiologists, using data from the Association of American Medical Colleges (AAMC) Faculty Roster System, found that fewer of the women were board certified and that the women's responsibilities differed from those of the men.[4] The women discussed in that study were principally engaged in teaching and patient care and less involved in research and administration. The women from the ages of 40 to 50 were heavily represented at the instructor level, and the women from the ages of 50 to 65 were heavily represented at the assistant professor level.

One study of career achievement among women physicians found only a single correlate of success among academic physicians: academic standing at the end of medical school. Although that study is limited in that it did not collect data on research, administrative, or teaching responsibilities, another of its findings may be relevant: marital status and number of children showed no consistent association with academic rank.[5]

Very few studies have yielded results that institutions and specialty societies could use in their attempts to encourage the advancement of women. A clearer picture is needed of the difference in the rates at which men and women move up through the academic ranks and the reasons for the difference. One way to clarify that picture is to compare the men and women in a cohort of faculty at a selected time following their first faculty appointments.

Method

The data used in this study were extracted from the AAMC Faculty Roster System, a computer data-base system containing information about

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Dr. Dial is assistant director for research studies, Office of Research, American Psychiatric Association; Ms. Bickel is director for women's programs and senior staff associate, Division of Institutional Planning and Development, Association of American Medical Colleges; and Dr. Lewicki is clinical professor of radiology, Georgetown University School of Medicine; all are in Washington, D.C.

Address correspondence and requests for reprints to Ms. Bickel, Division of Institutional Planning and Development, AAMC, One Dupont Circle, Washington, DC 20036.

Table 1

Numbers and Percentages of Men and Women Faculty Members, by Academic Rank, at All U.S. Medical Schools, 1988*

	Men		Women	
Rank	No.	Percent	No.	Percent
Professor	15,285	31.5	1,094	9.4
Associate professor	12,535	25.8	2,307	19.8
Assistant professor	16,348	33.7	5,743	49.2
Instructor	3,348	6.9	2,032	17.4
Other	995	2.1	487	4.2
Missing	24	0.1	10	0.1
Total	48,535	100.0	11,673	100.0

*Data obtained from the Faculty Roster System data base of the Association of American Medical Colleges. Percentages are rounded.

the current appointments, employment histories, training, credentials, and demographic characteristics of current and former full-time salaried faculty at U.S. medical schools from 1966 to the present. The data are collected directly from the schools and are updated continuously. At any time the data-base contains information about approximately 80–90% of all active full-time salaried U.S. medical school faculty.[6]

For this project, the researchers used the data for current and former (inactive) internal medicine and radiology faculty who received their first appointments as medical school faculty in 1976 ($N = 1{,}379$). Internal medicine was selected for study because it has more faculty than any other specialty; radiology was selected because it is midrange among specialties in the number and percentage of residents who are women. In order to minimize the number of uncontrolled extraneous variables, the analysis of this group was limited to those faculty with M.D. degrees. This smaller group was the 1976 cohort of entering faculty ($n = 1{,}199$).

The following 17 variables were selected from the data base for use in this study:

- Department
- Rank (professor, associate professor, assistant professor, instructor, and other/unknown)
- Ethnic-racial category (American Indian, Asian, Black, Mexican-American, Puerto Rican, Caucasian)
- Sex
- Year of birth
- Year appointed to current position
- Year appointed to first medical school faculty position
- Type of doctorate (M.D., Ph.D., other, or none)
- Year of doctorate
- Teaching responsibility (not reported, reported, or reported as primary responsibility)
- Research responsibility (not reported, reported, or reported as primary responsibility)
- Patient care responsibility (not reported, reported, or reported as primary responsibility
- Administrative responsibility (not reported, reported, or reported as primary responsibility)
- Primary medical specialty
- Secondary medical specialty
- Active or deactivated status
- Year deactivated, if applicable

The variables dealing with areas of professional responsibility are derived from a question on the Faculty Roster questionnaire: "Check usual activities in which you spend at least 10% of your time annually. If a primary responsibility exists, enter 'P' in that category (only one box for 'P')." The question is followed by the following list: teaching/instruction; research; patient care (patient education); administration; other professional activities. A check mark in a box adjoining an item is interpreted as "reported" and a blank as "not reported."

Findings

The first question asked was whether in the 1976 entry cohort ($n = 1{,}199$) the women were more likely than the men to have dropped out of academic medicine. In departments of radiology and internal medicine, they were not: at the end of 1986, 47.4% of the women and 39.8% of the men in radiology were still active, and the corresponding figures for internal medicine were 50.7% and 49.3%. The difference between the sexes on these percentages was not statistically significant for either specialty.

Only the physicians who were active at the end of 1986 were included in the remaining analyses. In order to maintain maximum comparability and alleviate statistical problems associated with sparse and empty cells, it was necessary to eliminate from the analysis those holding the rank of instructor (16 internal medicine and four radiology faculty) and those who checked "other/unknown" in the "rank" category (one person in a radiology department). Thus, the total number of faculty in subsequent analyses was 546.

Table 2 depicts the distributions of academic rank, by sex and specialty, of the active 1976 entry cohort. This comparison clearly shows a disparity in rank attainment between the men and women at the end of their first 10 years on radiology and internal medicine faculties. The difference between the men and women is statistically significant for both specialties.

In order to compare the ethnic-racial compositions of the two specialties while avoiding problems of small cell size, it was necessary to collapse the ethnic-racial categories into "minority" (all but "Caucasian") and "nonminority ("Caucasian"). In de-

Table 2

Numbers and Percentages, by Academic Rank, of the 546 Men and Women in Internal Medicine and Radiology in 1986 Who in 1976 Had Attained the M.D. Degree and Received Their First Faculty Appointments*

	Men		Women	
Rank/Specialty	No.	Percent	No.	Percent
Internal Medicine†				
Professor	75	19.0	1	2.9
Associate professor	206	52.3	17	48.6
Assistant professor	113	28.7	17	48.6
Total	394	100.0	35	100.0
Radiology‡				
Professor	29	28.7	0	0.0
Associate professor	41	40.6	6	37.5
Assistant professor	31	30.7	10	62.5
Total	101	100.0	16	100.0

*Data obtained from the Faculty Roster System data base of the Association of American Medical Colleges. Percentages are rounded.

†Differences between men and women: chi-square was 9.03 with 2 df; $p < .05$.

‡Differences between men and women: chi-square was 8.61 with 2 df; $p < .05$.

partments of medicine, the women faculty of the 1976 entry cohort were significantly more likely ($p < .001$ based on a chi-square test) than the men to be members of minority ethnic or racial groups (32.4% of the women as compared with 10.2% of the men). In departments of radiology they were not (17.6% of the women as compared with 22.0% of men).

Although large majorities of both sexes in both radiology and medicine reported some teaching responsibilities, the women in internal medicine were significantly less likely ($p < .01$ based on a chi-square test) than the men to report such responsibilities (84.2% as compared with 95.5%). In radiology, the difference was reversed (96.0% of the men; 100% of the women) but not statistically significant.

In departments of medicine, the men and women of the 1976 cohort were about equally likely (75.5% of the men; 78.9% of the women) to report research responsibilities; the difference was not statistically significant. However, in radiology the difference was striking, with 71.3% of the men but only 44.4% of the women reporting research responsibilities ($p < .05$).

Large majorities of both sexes in both types of departments (90.1% of the men and 89.5% of the women in

Table 3

Numbers and Percentages of Internal Medicine and Radiology Faculty Physicians by Academic Rank Who in 1976 Had Attained the M.D. Degree and Received Their First Faculty Appointments, Reporting Their Research and Administrative Responsibilities in 1986*

	Research				Administration			
	Research		No Research		Administration		No Administration	
Rank/Specialty	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Internal Medicine†								
Professor	67	20.6	8	8.0	44	22.3	31	13.5
Associate professor	185	56.7	37	37.0	104	52.8	118	51.5
Assistant professor	74	22.7	55	55.0	49	24.9	80	34.9
Total	326	100.0	100	100.0	197	100.0	229	100.0
Radiology‡								
Professor	23	29.5	6	16.7	11	35.5	18	21.7
Associate professor	35	44.9	10	27.8	12	38.7	33	39.8
Assistant professor	20	25.6	20	55.6	8	25.8	32	38.6
Total	78	100.0	36	100.0	31	100.0	83	100.0

*Data obtained from the Faculty Roster System data base of the Association of American Medical Colleges. Percentages are rounded.

†Differences between academic ranks: for research, chi-square was 38.94 with 2 df; $p < .001$; or administration, chi-square was 8.23 with 2 df; $p < .05$.

‡Differences between academic ranks: for research, chi-square was 9.70 with 2 df; $p < .005$; for administration, chi-square was 2.74 with 2 df; $p > .05$.

internal medicine, 97.0% of the men and 94.4% of the women in radiology) reported having some patient care responsibilities. The differences between the men and women were not statistically significant.

With regard to administrative responsibilities, the pattern resembles that seen with regard to research responsibilities. The men-women difference is small (46.0% of the men versus 44.7% of the women) and not statistically significant for those in internal medicine but quite noticeable for those in radiology (29.7% of the men compared with 5.6% of the women—$p < .05$).

Table 3 shows the overall relationship in 1986 between academic rank and research responsibilities and between rank and administrative responsibilities, without regard to sex. Research responsibilities were significantly associated with higher rank in both radiology and internal medicine. Administrative responsibilities were significantly associated with higher rank in departments of internal medicine but not in radiology departments.

Discussion

This analysis discloses for one cohort of active physicians the differences between men and women in rank attained 10 years after their first appointments to a medical school faculty, showing that the disparities were greater in radiology than in internal medicine. The study also affirms that research responsibilities were associated with the attainment of higher academic rank. In internal medicine but not in radiology, administrative responsibilities were also found to be associated with higher rank. Given the larger overall percentage of internal medicine faculty reporting administrative responsibilities, this difference between the specialties with regard to promotions is not altogether surprising.

In radiology but not in internal medicine, the men studied were much more likely than the women to report both research and administrative responsibilities; this disparity probably accounts for the greater rank disparities between the sexes in this specialty than in internal medicine. In internal medicine, however, even though the same percentage of men and women reported research responsibilities, differences in the ranks attained are evident. The limits of the AAMC Faculty Roster System as a source of data on research activities make it difficult to explore the implications of this finding. The only national study of research activities of medical school faculty was a joint effort of the AAMC and the Association of Professors of Internal Medicine and was limited to departments of internal medicine.[7] An unpublished analysis of these responses classified by sex showed that the women had less formal preparation for research, less laboratory space assigned to them, and less overall research involvement than the men.[8]

A comparative profile of the research and other activities of women and men faculty that relies only on AAMC Faculty Roster data is necessarily limited. More studies are needed to achieve a better understanding of the lag in women's advancement in academic medicine. Many questions should be addressed; for example:

1. Are women less interested in research than men? Data from the AAMC's survey of 1987 graduating seniors[9] reveal very little difference; during medical school 43% of the women and 46% of the men were investigators on research projects; 19% of the women and 24% of the men authored published research papers. Moreover, in 1987 as great a proportion of women as men predicted research fellowships for themselves during graduate medical education. Will influences later in their careers deter women from pursuing research interests with the same determination as men?

2. Are women faculty acquiring the information and guidance from mentors necessary to plan successful careers in academic medicine? How can information networks for women faculty be improved? Given the scarcity of women who can serve as mentors, can ways be found to help men provide more effective guidance to women?

3. What characteristics of the academic value system need to be examined vis-à-vis the advancement of women? Are women disproportionately attracted by tracks that emphasize clinical teaching over bench research for promotion, such as the clinician-educator tracks that exist at some institutions? Are "stop-the-clock" programs, allowing faculty to postpone tenure decisions, helpful to women in academic medicine?

4. How can deans and department chairmen be encouraged to address the differential between men's and women's rates of academic advancement?

The analysis offered in this paper is only a small part of the research needed if the questions surrounding the advancement of women in academic medicine are to be answered.[10] The scientific community has led the way in studies of sex differences in the careers of scientists and engineers,[11] and the representation of women in the higher echelons of academic science is receiving increasing notice.[12,13] This attention and research may provide some valuable pointers for the study of women's career development on medical school faculties.

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Survey Results and a Recommendation for a Change in U.S. Medical Physiology Curricula

RONALD D. CARLIN, Ph.D.

Abstract—Both the recent advances in molecular biology and the dilemma of teaching a larger volume of more detailed material to students from a declining, weaker applicant pool necessitate a critical reappraisal of the medical physiology curriculum and pedagogy. An extensive survey of the physiology curricula in 107 U.S. medical schools conducted during the 1986-87 academic year revealed that physiology was taught as a separate course, averaging 100.1 lecture hours, 24.0 laboratory hours (usually dealing with cardiovascular and pulmonary physiology), and 25.6 conference hours. The physiology courses offered by the schools surveyed averaged 21.8 weeks in duration and were taught by an average of 13 faculty (72.5% with Ph.D. degrees, 21.8% with M.D. degrees, and 5.4% with both M.D. and Ph.D. degrees). The evolution of the physiology curriculum has been slow; as a result the need for change is great. Physiology departments must give a high priority to reorganizing and revitalizing teaching. Additionally, the physiology curriculum must be critically examined. There is an urgent need to reevaluate course content, decide the fate of the student laboratory, and develop new, innovative teaching techniques. The ubiquity of these problems among medical schools suggests that they be addressed at a national level. *Acad. Med.* 64(1989):202-207.

Physiology, by definition, is the study of the body's functions. Therefore, physiology logically serves as an infrastructure upon which numerous other disciplines build[1]—for example, pharmacology (how chemical agents modify function), pathology (how disease states alter function), and medicine itself (the study of normal and abnormal human physiology). Physiology has been described by students and faculty in both basic and clinical sciences as one of the most, if not the most, clinically relevant basic science.[2]

The face of physiology is changing as the understanding of body functions is resolved at the cellular level and, in some cases, the molecular level. Physiology must merge and integrate with molecular biology in order to remain at what has been called the "cutting edge" of the biomedical sciences.[3] The alternative is that physiology will become a stagnant pool of knowledge or a kind of "gross anatomy of the 1980s."[3]

Assuming that physiology and molecular biology can be appropriately integrated, a new problem arises: given the limitations of an already overcrowded four-year medical curriculum,[4,5] how do faculty convey to their students a significantly expanded knowledge base, encompassing the most current level of understanding at a cellular level, without compromising the crucial need to foster an appreciation of "classical" organ-system physiology?[6] Certainly, some degree of understanding of the body function at each organizational level is required.[7] Will attempts to squeeze an expanded knowledge base into a shrinking time slot allotted for the physiology curriculum necessitate the complete elimination of an already compromised student labora-

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Dr. Carlin is professor, Department of Human Anatomy and Physiology, College of Dental Medicine, Fairleigh Dickinson University, Hackensack, New Jersey.

Address correspondence and requests for reprints to Dr. Carlin, professor of physiology, Fairleigh S. Dickinson College of Dental Medicine, Fairleigh Dickinson University, 140 University Plaza Drive, Hackensack, NJ 07601.

tory and thereby completely expunge the already minimal hands-on approach to learning and the practical reinforcement of physiological principles? The future of the medical physiology curriculum is complicated still further as various organ systems or topics are gradually removed from the physiology course, either to be taught as parts of courses in other basic sciences or clinical disciplines or to be developed into separate curricular entities. Overlying all of this is the added handicap that the student applicant pool seems to be declining in both number and academic ability.

In the face of such pressing issues, it is obvious that more attention must be paid to the development and evolution of the medical physiology curriculum. The study described here was undertaken to generate a precise up-to-date picture of the medical physiology curriculum that will allow schools to compare their physiology programs with the average curriculum. Equally important, it will permit assessment of the status of the medical physiology curriculum from a nationwide perspective and, as a result, provide a basis upon which to evaluate how that curriculum needs to be modified or, if necessary, redesigned.

Method

A three-page questionnaire was designed to obtain data from various types of human physiology curricula (for example, those in medical, dental, graduate, nursing, and other programs). Topics addressed by the questionnaire included general curriculum organization, as well as content, duration, and topic emphasis for the lecture, laboratory, and conference components of the curriculum. In addition, data were collected on faculty (numbers, backgrounds, and lecture responsibilities), examinations (number, types of questions, and grading system), and the use of teaching adjuvants (such as printed notes, computers, and textbooks). Last, a portion of the questionnaire contained opinion questions to determine what physiology educators believed to be the optimal physiology curriculum.

Questionnaires were sent in early August 1986 to members of the Association of Chairmen of Departments of Physiology (ACDP). Chairpersons (or through their offices, the appropriate supervisory faculty or program directors) were requested to complete a questionnaire for each comprehensive, or organ-system, course being taught by the faculty. The ACDP membership at that time consisted of 151 chairpersons or physiology program directors. Questionnaires were mailed to 148 ACDP members (136 from the continental United States, 11 from the remainder of the Northern Hemisphere, and one from Hawaii). Of the forms coming from within the continental United States, 107 (approximately 79%) were from medical school physiology departments.

Those individuals who did not respond to the initial mailing were sent a second form in mid-October 1986. In those instances in which there was no response to the second mailing, the chairperson was contacted late in 1986 or early in 1987 and urged to participate. Data from the questionnaires were tabulated and statistically analyzed employing a computer and a standard statistical software package.

In some instances the returned forms contained unanswered questions. Whenever feasible, the voids were filled after telephone conversations with representatives of the institutions involved. In the calculation of mean values, values of zero, assigned when a particular component was not present in the physiology curriculum, or there was no reply to a specific question, were not included.

Results

A survey response rate of approximately 90% was achieved. The responses consisted of 191 forms returned from 131 institutions. Of the 191 forms completed, 56.8% (111 questionnaires from 107 medical schools within the continental U.S. and two Canadian, one Puerto Rican, and one Mexican medical school) pertained to medical school physiology curricula. The data presented here are confined to the responses from the 107 U.S. medical schools, which constituted 86.3% of the 124 medical schools in the continental United States at that time. Accordingly, the data should accurately reflect the U.S. medical school physiology curriculum at that time.

Of the 107 medical schools responding, 92 (86%) taught physiology as a separate course, and nine schools taught it as part of an organ-system approach. The remaining six schools taught it in some other curricular format, this most often being a hybrid in which some areas were taught in separate courses and other areas were presented as parts of an integrated, or organ-system, approach.

Lectures

The survey showed that the average medical physiology curriculum contained 100.1 (SD = 39.5) lecture hours, with 76% of the 107 respondents indicating that their physiology curricula contained sufficient numbers of lecture hours. Among the remaining 24% — those that indicated that their programs contained insufficient numbers of lecture hours — there was no consensus as to which specific areas or topics should be given more time. Sixty-three percent of the respondents reported that the number of lecture hours had remained constant over the previous five years; however, 27.1% noted a decrease in lecture hours. Only 9.3% of the programs had experienced an increase in lecture hours over the five-year period.

As shown in Table 1, the individual schools did not necessarily have all of the traditional organ-system topics within their physiology curricula. Only cardiovascular, pulmonary, and gastrointestinal physiology were present in all of the physiology curricula. The remaining topics, with the exception of central nervous system (CNS), physiology were incorporated in 80.1 - 99.1% of the physiology programs.

Only 59.3% of the programs included CNS physiology; however, when present it was the component

Table 1

Percentages of 107 U.S. Medical Schools Teaching Each of Nine Topics in Classroom, Laboratory, and Conference Formats, and Average Durations and Average Percentages of Total Time Devoted to Each Topic in Each Format, 1986–87*

	Classroom Format			Laboratory Format			Conference Format		
Physiology Topic	Percentage of Schools	Average Duration (hours)	Percentage of Total Time	Percentage of Schools	Average Duration (hours)	Percentage of Total Time	Percentage of Schools	Average Duration (hours)	Percentage of Total Time
Cardiovascular	100.0	19.4	20.1	75.0	8.8	41.9	75.0	5.7	25.9
Respiration	100.0	12.4	12.8	67.6	5.1	24.7	70.4	3.9	16.7
Renal	99.1	11.3	11.7	38.9	4.8	13.9	69.4	3.9	15.3
Endocrine	89.8	16.6	16.5	14.8	6.9	12.5	57.4	4.8	17.3
Gastrointestinal	100.0	9.6	10.2	20.4	3.9	11.3	53.7	3.0	12.2
Membrane/cell	88.9	7.5	7.5	32.4	4.6	18.1	48.1	3.2	10.6
Neuromuscular	89.8	6.8	6.6	34.3	4.8	18.6	47.2	2.7	9.6
Acid-base	80.1	3.9	4.0	12.0	3.1	8.7	38.0	1.8	8.1
Central nervous system	59.3	19.6	14.2	22.2	8.5	20.1	25.9	6.2	13.8

*Data taken from a survey of members of the Association of Chairmen of Departments of Physiology; 107 of the respondents were from U.S. medical schools.

that was assigned the most lecture time with an average of 19.6 lecture hours devoted to it. Though it had the longest average lecture duration, CNS physiology ranked third in terms of the average percentage of the total curricular time devoted to any topic in the medical school physiology programs (14.2%). Cardiovascular physiology, the component with the second-longest average duration (19.4 hours), occupied the largest part of the physiology curriculum (20.1%). The reason for this apparent paradox is that those physiology programs that included a CNS section were, as a result of its inclusion, of longer duration. Because the CNS section was a segment of longer programs, it represented a smaller fraction of total program duration. Cardiovascular physiology was present in all programs; in shorter physiology programs (schools with a separate neuroscience course and no CNS physiology section), it constituted a larger percentage of the total duration.

In addition to the major organ systems, most schools (73.2%) included in the physiology curriculum at least one additional lecture topic, with many schools (40.7%) having two, and some (7.4%) incorporating three other topics. Thirty-three different topics of this kind were recorded. The five most frequently cited and the frequencies with which they were mentioned were temperature regulation (21.8%), exercise physiology (17.3%), metabolism (9.6%), reproductive physiology (9.6%), and integrative physiology (6.4%).

With respect to the integration of molecular biology into the medical curriculum, 14.5% of the responding institutions indicated that it was included as part of physiology, 24.1% presented it as a separate course (averaging 75.5 hours), and 61.4% incorporated the material into one or more of the other basic science disciplines. Where molecular biology was included as a part of a single basic science other than physiology, that science was most often biochemistry; when molecular biology was presented in conjunction with two or more disciplines, these were most frequently biochemistry and histology.

Laboratory

Though almost all the responding medical schools (87.4%) indicated that the student laboratory was a necessary component of a physiology curriculum, 46.5% of the institutions reported a decrease in the number of laboratory hours over the previous five years. Only 4.0% reported an increase over the same period. While the laboratory component was generally shrinking, most schools (67.9%) indicated that their physiology curricula contained sufficient laboratory time. Approximately 25% of the responses cited a need for additional laboratory time, indicating that an additional 13.7 (SD = 9.5) hours would be necessary. While only 24.3% of the responding institutions used computer-simulation laboratory exercises, approximately two-thirds of the medical schools reported having some form of human laboratory exercise and one or more animal experiments. Of the schools that used animals in the student laboratory, 84.4% used dogs.

Table 1 includes the percentages of schools having one or more laboratory exercises devoted to each organ system, the average total duration of the laboratory exercise or exercises related to that organ system, and the percentages of the total laboratory time devoted to each organ system. As evidenced in the table, only two topics had a related laboratory exercise or exercises in the majority of U.S. medical schools surveyed. Cardiovascular laboratories were conducted in 75.0% of the schools, had an average duration of 8.8 hours, and accounted for 41.9% of the total laboratory time; respiratory laboratories were taught in 67.6% of the schools, had an average duration of 5.1 hours, and occupied 24.7% of the total laboratory time. Exercises dealing with the central nervous system were presented in only 22.2% of the medical schools; however, where they were conducted, on average these exercises accounted for 20.1% of the total laboratory time and had a duration of 8.5 hours.

Conferences

The numbers of the responding medical schools that had allotments of time devoted to individual organ systems (see Table 1) varied over a wide range, extending from 75.0% for cardiovascular physiology to 25.9% for CNS physiology. Predictably, cardiovascular conferences constituted the largest portion of the total conference time (25.9%) and had the second longest total duration (5.7 hours). When present in the curriculum, CNS physiology conferences had the longest average duration, 6.2 hours. The average total curricular conference time was 25.6 (SD = 23.8) hours.

Examinations and Grading

The average medical physiology program contained five examinations, with the final examination in most programs (71.4%) being cumulative. Examinations most frequently consisted of multiple-choice questions. The types of questions and the percentage of programs employing each type were multiple-choice, 91.0%; computational questions, 52.3%; multiple-multiple choice (that is, questions accompanied by four or five possible answers that can be used in varying combinations; for example, answer "A" if choices 1 and 3 are correct, answer "B" if choices 2 and 4 are correct, etc.), 45.0%; true-false, 37.8%; essay, 31.5%; fill-in-the-blank, 27.0%; case studies, 21.6%; other forms, 18.0%; and oral examinations, 3.6%.

While the majority of programs (80.4%) indicated that they used "national-board-type" questions, only 24.3% of the respondents indicated that the national boards influenced the content or weighting of topics in their programs. In terms of student grades, schools were almost equally divided between letter or number grades (44.0%) and pass or fail grades (46.8%), with the remaining schools (9.2%) implementing a hybrid form of grading that can best be described as an expanded pass or fail system (for example, honors, high pass, pass, and fail). Of the physiology curricula that had a laboratory component, 56.8% did not administer any laboratory grade, 38.3% incorporated the laboratory grade as a portion of the student's final grade, and 4.9% had a separate laboratory grade.

Faculty

The average medical physiology curriculum had 13 participating lecturers; 72.5% of them held Ph.D. degrees, 21.8% held M.D. degrees, and 5.4% held both. Approximately 75% of the faculty held appointments in physiology, with the remainder being drawn from other disciplines. Most frequently, those faculty were from medicine (34.3%), surgery (10.3%), obstetrics and gynecology (10.3%), pediatrics (8.6%), and neurology (8.0%). Ninety-five schools cited their average numbers of lecture hours per instructor; the mean value of these responses was 10 hours. Twenty-four schools also listed the greatest and least numbers of lecture hours per instructor; values ranged from a low of one to a high of 74 hours.

Instructional Resources

Printed notes were used in most physiology programs (75.5%), as were videotapes (67.9%), whereas computers had been adopted in only 40.4% of the schools. In those schools where computers were employed, the majority (60%) used them for laboratory stimulations; in the remaining programs they served as a mechanism for study enhancement or student self-assessment. Most (83.6%) of the programs that did not use computers indicated that they planned to adopt them.

Approximately 70% of the medical schools surveyed required the students to purchase one or more texts. Within that population of schools, 66.6% required a single comprehensive text, 16.7% required a series of monographs, and 16.7% required a comprehensive text plus one or more monographs. Among the comprehensive texts, the Guyton textbook[8] and the Berne and Levy book (first edition)[9] were equally popular as a single required text (22.2% of the schools using each). However, when considering texts used in combination with monographs, the Guyton textbook had a slight edge (5.6% versus 4.2%). Eighty-six percent of the physiology programs recommended the purchase of one or more books by the students. The comprehensive text most frequently recommended, either by itself or in combination with one or more monographs, was the Best and Taylor text edited by West.[10]

The Optimal Curriculum

In a series of opinion questions, the respondents described what they considered an optimal physiology curriculum. The data obtained from these questions showed the optimal numbers of lecture and laboratory hours to be 106.5 and 42.4, respectively, with an optimal curriculum duration of 22.1 weeks. These values, when compared with the actual values of 100.1 and 24.0 hours and an average curriculum duration of 21.8 weeks, show close agreement.

Discussion

Progressive educators have for some time advocated the organ-system approach to facilitate integrative learning in the medical curriculum. Despite this, it appears that medical physiology is still being taught in a traditional manner, that is, as a separate course (86% of the responding schools), with formal lectures being the principal teaching method.

Medical physiology curricula vary considerably in content and duration, as shown by the large standard deviations in some of the data. Lecture content varies, as is apparent in Table 1. Only three organ systems were common to all the programs surveyed. Where an organ system or topic was not included in the physiology course of instruction, it was incorporated in some other segment of the medical curriculum or, in some cases, topics from the physiology curriculum had evolved into separate, distinct curricular entities.

An example of this type of evolution is molecular, or cell, biology: 24.1% of the schools indicated that that subject was presented as a separate course. This was also the case with CNS physiology, which accounts for the fact that only 59.3% of the programs devoted a block of time to this topic. Because CNS physiology entails a substantial amount of material, it is not surprising that it would have the longest average duration and thus generally be a component of longer physiology curricula. This explains why CNS physiology, as compared with cardiovascular and endocrine physiology, constituted a smaller average fraction of the total lecture time devoted to any one topic.

Clearly, the laboratory component of the medical physiology curriculum is waning. The average total laboratory time reported was 24.0 (SD = 20.0) hours, which constitutes more than a 67% decrease from the 73 hours reported in 1975.[11] Almost half (46.5%) of the responding institutions reported undergoing a reduction in student laboratory time over the previous five years, and only 4.0% reported having an increase.

In most of the schools surveyed, laboratory time was largely devoted to human studies and animal experiments (65.8% and 63.1%, respectively). With respect to the animal laboratories, 84.4% of the programs indicated that dogs were used for one or more laboratories. This finding is surprising in view of the prominent and controversial animal rights issue as well as the soaring cost of animals (even those that are unconditioned).

It is worth noting that only 24.3% of the physiology programs used computer-simulation exercises in their laboratories. This number can be expected to grow significantly, since the vast majority (83.6%) of the schools not employing computers planned to adopt them. Additionally, the development of more software, increased availability of software through sharing programs, declining computer costs, and the attrition of senior, more traditional faculty who are reluctant to implement computers all favor increased adoption of computers.

Although laboratory exercises using computer simulations have many drawbacks, they do have one distinct advantage: they may be performed during the student's unstructured time. For this reason, they also offer enormous potential as a study enhancer, especially in those areas of physiology that involve explanation of principles through problem-solving. The use of computers (and other audiovisual media) in this manner can significantly increase the active learning process; that is, these tools allow students to participate actively in the learning process, with the only limiting factor being the availability of software.

A review of Table 1 shows that the organ systems may generally be divided into three categories: those to which most physiology programs (approximately 70–75%) have devoted some laboratory time, those to which a moderate number of programs (20–40%) have devoted laboratory time, and those to which few programs (10–15%) have dedicated any time. The cardiovascular and respiratory systems, appropriately, fall into the first category. These systems are well suited for student laboratory exercises because they respond rapidly to any stimulation and also represent some of the more difficult and quantitative subject matter. Respiration is an especially fitting laboratory topic because it lends itself to human studies. At the opposite end of the spectrum, endocrine physiology and acid-base balance are not particularly well suited to study in the student laboratory, nor are they conceptually difficult; thus, laboratory experiences would not significantly aid student understanding in these areas.

Implications

The findings of this survey concerning the optimum physiology curriculum reveal a good correlation with the existing curricula. Despite this, the issues reviewed at the beginning of this article make it clear that the structure and content of the medical physiology curriculum require revision. Yet little regular, systematic examination of content is occurring.[12]

Moreover, the quality of physiology instruction must be scrutinized. In previous years, many faculty in physiology education, like faculty in most other fields, viewed their teaching responsibilities as a necessary chore,[13] especially since universities have tended to value research more than teaching. But for some time a small group of physiologists has been urging that attention be paid not only to what is taught and how it is taught but also to the quality of instruction.[14,15] In the final analysis, the success of any curriculum depends on the extent to which the instructors are committed to making the program work well.[16] This need to ensure excellent instruction is, unfortunately, not limited to physiology or medicine —inadequacies in instruction permeate undergraduate programs in many fields nationwide. The result has been a recent call by university presidents for better teaching and a reiteration that "teaching is the first business of our universities."[17]

Reforms in both the content and the pedagogy of physiology have been advocated for many years.[18,19] It is not too late to take such recommendations seriously, and the need to do so has become urgent. Change in physiology teaching is crucial to the future of medical education, because physiology is the apex of the pyramid of the basic sciences and at the same time the foundation of the pyramid of the clinical sciences. As Claude Bernard noted, "physiology is the basis of all medicine."[20]

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A Review of Medical Education and Medical Informatics

R. BRIAN HAYNES, M.D., Ph.D., MICHAEL RAMSDEN, M.D.,
K. ANN McKIBBON, M.L.S., CYNTHIA J. WALKER, M.L.S.,
and NANCY C. RYAN, M.Sc.

Abstract—Physicians have considerable difficulty collecting and interpreting information from patients, dealing with the uncertainties associated with diagnosing and treating their patients, communicating precisely with one another, keeping up to date, and applying recommended procedures when indicated. Some of the advances in information technology may help physicians to manage information more effectively through more accessible, validated clinical indexes, data bases of diagnostic test characteristics, computerized audits of clinical activities with feedback, expert systems, on-line access to the medical literature, and other tools of medical informatics. Medical educators can catalyze this process by facilitating the introduction of information technology into academic clinical settings so that students can learn its use first-hand and by promoting the evolution of this and other aspects of medical informatics, a new discipline dedicated to the solution of information problems in health care. The potential roles for computer-aided instruction and centralized computer laboratories in medical schools are much less clear. *Acad. Med.* 64(1989):207-212.

The next decade will be both agonizing and exhilarating for those committed to achieving cost-effective health care. On the one hand, biomedical science has spawned an astonishing array of genuine advances in health care that can prevent disease, save lives, reduce disability, and relieve suffering. On the other hand,

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This paper is based on a presentation for the Conference on Medical Education and Cost-Effective Health Care, sponsored by the Rockefeller Foundation and the World Health Organization, at the Bellagio Conference Center, Bellagio, Italy, March 21-25, 1988.

Dr. Haynes is professor, and Dr. Ramsden is assistant professor, Department of Clinical Epidemiology and Biostatistics and Department of Medicine; and Ms. McKibbon, Ms. Walker, and Ms. Ryan are senior researchers, Department of Clinical Epidemiology and Biostatistics; all are at McMaster University, Hamilton, Ontario, Canada, and are members of the Health Information Research Unit.

Address correspondence and requests for reprints to Dr. Haynes, Health Information Research Unit, Room 3H7, McMaster University Medical Center, 1200 Main St. West, Hamilton, ON, L8N 3Z5, Canada.

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tive role in humanizing their educational experience. Positive modeling for clinical relationships between physicians and patients has helped first-year students examine their own values and ideals. They now enter their clerkships more aware of the ethical issues and the human values concerns in the practice of medicine, and both medical students and faculty are more conscious of ethics and human values.

Our clear impression is that the effort to humanize medical education at Duke enjoys a broad base of support. The goals speak to a larger audience, and the effort itself communicates a crucial message to both students and faculty.

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ALLEN M. SINGER, Ph.D.

Projections of Physician Supply and Demand: A Summary of HRSA and AMA Studies

Abstract—There is concern that the United States may have a surplus of physicians soon. In a continuation of a movement started around 1980 by the Graduate Medical Education National Advisory Committee (GMENAC) to quantify and project supply and demand for physicians, the American Medical Association (AMA) and the Health Resources and Services Administration (HRSA) have recently produced their latest studies on this subject. The HRSA conclusion, published in its 1988 report to the President and Congress on the status of health personnel in the United States, is that a surplus may come as early as 1990 and will probably worsen by the year 2000. The AMA study, also published in 1988, agrees with the HRSA and the GMENAC that supply will probably grow faster than demand, but it disclaims the notion of a surplus or shortage because that would imply judgments about the adequacy of current utilization rates by all segments of the population. The HRSA report cites a 1986 finding by the Robert Wood Johnson Foundation that access to medical care deteriorated between 1982 and 1986 for minorities and lower-income groups. On the supply side, the HRSA's estimates are somewhat higher than the AMA's, mainly because the former assumes faster growth in foreign medical graduates. Both studies use a demand-based approach to projecting the number of physicians required, but there are considerable differences in the assumptions made about future utilization rates. *Acad. Med.* 64 (1989):235–240.

In recent years the Health Resources and Services Administration (HRSA) and the American Medical Association's Center for Health Policy Research (hereafter in this paper referred to as the AMA) have produced projections of physician supply and utilization to the year 2000 and beyond. Both studies project continued strong growth in physician supply, but they differ in their interpretations of this trend. The HRSA studies tend to support the 1981 conclusion of the Graduate Medical Education National Advisory Committee (GMENAC)[1] that a surplus of physicians will emerge in the United States in the next decade. The sixth and most recent HRSA study in the series shows an explicit excess of approximately 70,000 physicians over requirements in the year 2000,[2] but the report warns of the uncertainties involved in estimating future supply and requirements and urges that the results be interpreted with caution. (This report uses models of supply and demand developed by the HRSA's Bureau of Health Professions.)

The 1988 AMA study[3] concedes that supply will probably grow faster than

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Dr. Singer is senior research associate, Section for Operational Studies, Association of American Medical Colleges, Washington, D.C.

Address correspondence and requests for reprints to Dr. Singer at the AAMC, One Dupont Circle, NW, Washington DC 20036.

utilization but concludes that such growth does not necessarily imply a surplus. In fact, the AMA quite properly disclaims that its projections can be interpreted as surpluses or shortages because these are normative concepts that involve judgments about the appropriate level of utilization rates. Nevertheless, the AMA — phrasing its results in terms of percentage changes in supply and utilization between 1985 and 2000 — concludes that supply will increase by almost 24% over that period compared with a 14.5% increase in utilization.[3] (This study was produced by the AMA's Center for Health Policy Research but the projections have not been endorsed officially by the AMA's House of Delegates.)

Table 1

Comparison of AMA and HRSA Projections of Annual Entrants to Physician Supply, 1986–96

	AMA		HRSA	
Source of Entrants	1986–87 (n = 18,183)	1995–1996* (n = 16,225)	1986–1987 (n = 19,137)	1995–1996 (n = 18,904)
U.S. medical graduates	15,802	14,222	15,872	15,639
Foreign medical graduates (FMGs)	2,381	2,003	3,265	3,265
U.S.-citizen FMGs	(1,134)	(756)	(1,134)	(1,134)
Foreign-national FMGs	(1,247)	(1,247)	(2,131)	(2,131)
Entering through graduate medical education	(1,247)	(1,247)	(1,247)	(1,247)
Entering practice directly	—	—	(1,604)	(1,604)
J-Visa returns†	—	—	(−720)	(−720)

*Neither the AMA nor the HRSA project any changes in the annual number of new entrants to physician supply after 1996. Source: AMA, see Ref. 3; HRSA, see Ref. 2.

†J-Visas are issued to temporary visitors, who are allowed up to seven years to complete their residency training and then must return to their home countries.

Comparison of the Studies

The HRSA and AMA studies can be compared in terms of their supply estimates, demand estimates, specialty requirements, and conclusions.

Supply Estimates

The fact that these studies use somewhat different methodologies makes comparisons of their results difficult, but it is worth noting that the AMA's supply estimates are lower than the HRSA's. For example, the AMA's best estimate of the supply of allopathic physicians in the year 2000 is 633,200,[3] compared with the HRSA's estimate of 667,700.[2] The discrepancy is due mainly to differences in assumptions about the future number of new physicians. As can be seen in Table 1, the AMA assumes a faster decline in the number of U.S. medical graduates (USMGs) between 1986 and 1996 than does the HRSA. Also, the HRSA projections include 1,604 entrants each year from foreign-national foreign medical graduates (FNFMGs) who will enter practice directly without acquiring graduate medical education in the United States. (HRSA then subtracts 720 FNFMGs per year who are expected to return to their home countries.) These new physicians are not included in AMA's projections. Figures 1 and 2 show these projections and

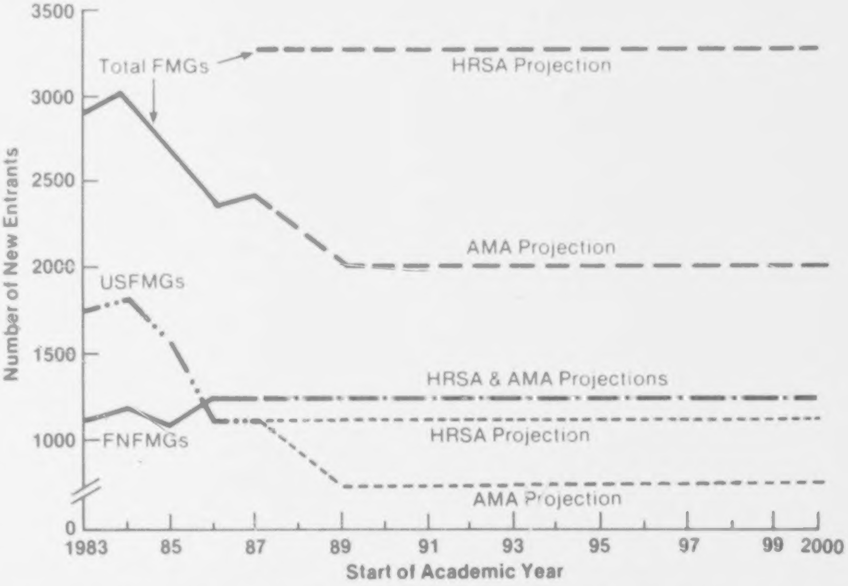

Figure 1. **New entrants to physician supply from foreign medical graduates (FMGs). For 1983–1987, data represent FMGs entering first-year residency programs in September of year shown. Both the HRSA and the AMA use these data to project new entrants to the year 2000. The HRSA's projection of total FMGs is higher than the AMA's because it includes 884 net new entrants each year from FMGs who enter practice directly without going through a U.S residency program. The AMA makes no allowance for this group. (USFMG = U.S. citizen FMG; FNFMG = foreign-national FMG.) Projections (1988–2000) are from the AMA (see Ref. 3) and the HRSA (see Ref. 2); data for 1983–1987 are from the AMA, *Directory of Residency Training Programs* (issued annually).**

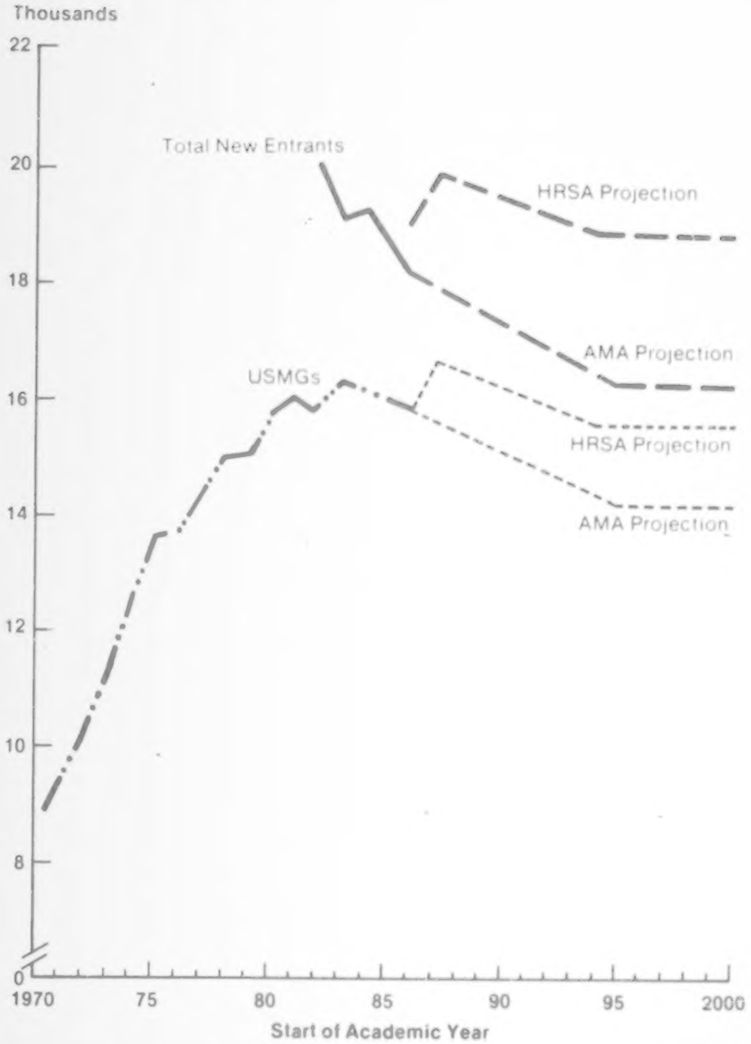

Figure 2. **U.S. medical school graduates (USMGs) and total new entrants each year to physician supply. Total new entrants are defined as USMGs and foreign medical school graduates (FMGs). The HRSA's projections of total new entrants are higher than the AMA's because the AMA foresees a faster decline in USMGs through 1996, and the HRSA includes FMGs thought to enter practice directly without going through a U.S. residency program, while the AMA does not. Data on USMGs for 1970–1986 are from the Association of American Medical Colleges. Data on FMGs for 1980–1986 are from the AMA (see ref. 3); projections (1988–2000) are from the AMA (see ref. 3) and the HRSA (see ref. 2).**

the time series data on which they are based.

The HRSA assumes that first-year enrollments in U.S. medical schools will decline by about 5% between 1987 and 1992. But the number of USMGs will decline by slightly less than that because the HRSA assumes an inflow of about 500 students each year who transfer with advanced standing.[6]

The AMA does not make an explicit projection of first-year enrollments but does assume that USMGs will decline by 10% between 1986 and 1996.

There are other differences in the data used by the AMA and the HRSA that lead to minor differences in supply estimates by the year 2000. For example, the number of active physicians in 1986 in the AMA's Physician Masterfile is used by both studies as the base of their supply projections—to which they add new entrants each year and subtract attrition. However, the AMA estimates the number of allopathic physicians in 1986 at 519,411, while the HRSA's estimate is 521,780. The latter includes 90% of the physicians classified by the AMA as "unknown activity status" or "unknown address." Both studies count each resident as an active physician and include physicians engaged in non-patient-care activities in their supply estimates.

The reports use different data for first-year medical school enrollments from 1982–1987, with the HRSA's numbers[2] being consistently higher than the AMA's[3] by 350–500 per year.

For attrition rates, both studies used data from the AMA's Physician Masterfile to derive age-specific and gender-specific rates for USMGs and foreign medical graduates (FMGs). In addition, the AMA develops attrition rates for each specialty and claims that retirement rates in general internal medicine, the medical specialties, and psychiatry are lower than those in hospital-based specialties (radiology, anesthesiology, and pathology).[3] The AMA also states that women have higher retirement rates than men, and FMGs have lower retirement rates than USMGs.

The HRSA report states that its estimated retirement rates show no major difference between men and women or between USMGs and FMGs.[2]

There are not sufficient data in the reports to reconcile these differences.

Demand Estimates

As might be expected, modeling the demand side involves more complicated calculations than modeling the supply side in these studies. Both the HRSA and the AMA start with physician utilization rates by various population segments in recent years. Then U.S. Census Bureau population projections are applied to the base-period utilization rates to derive the basic utilization projections. The HRSA then adjusts the basic projections to account for changes in prices, insurance coverage, and other non-price factors that might affect utilization rates — and labels the results "requirements."

The AMA does not make such extensive adjustments to the basic utilization projections, and labels its results "utilization." This subtle difference in terminology perhaps reveals something about the way each organization interprets its results. Although both the HRSA and the AMA are careful to point out that these projections neither define appropriate standards of care nor imply that current utilization rates are appropriate, the HRSA report leaves little doubt about its conclusion that a surplus of physicians will exist by 2000, while the AMA report does not arrive at that conclusion.

The HRSA's projection of requirements for physicians to the year 2000 shows somewhat faster growth (at 1.3% per year) than does the AMA's (at about 0.9% per year). This difference appears to be due mainly to the HRSA's adjustments to the basic utilization projections based solely on population growth, although the report is not at all clear on the magnitude of these adjustments and presents no data concerning them. A separate HRSA document[4] describes the requirements model in more detail and implies that such adjustments are included in the HRSA's requirements projections, but it does not present the data.

The AMA's utilization model assumes "that there will be no major changes in prices, incomes, epidemiology, or other factors that would significantly affect utilization patterns."[3]

Table 2 summarizes as much as can be learned about the approaches taken by the two studies to estimate demand.

Table 2

Summary of HRSA and AMA Models for Projecting Physician Demand

	AMA	HRSA
Units of measurement of physician utilization†	Office and telephone visits, but excluding telephone contacts.	Patient visits and hospital admissions.
Data sources	National Center for Health Statistics: NMCUES (1980) and NHIS (1985).* Utilization data were obtained for 1980 and adjusted to 1985, by specialty, for each sex, race, and age group.	National Center for Health Statistics: NHIS* and the Hospital Discharge Survey. Utilization rates in 1975 were obtained for 40 population segments (defined by age, sex, and income) and 20 forms of health care.
Average increase in demand	0.9% per year increase in total contacts between 1985 and 2000.	1.3% per year increase in requirements between 1986 and 2000.
Assumptions	1. Utilization patterns by age, race, sex, and income will remain constant. 2. Most of the projected increase in physician contacts is expected to be due to a 10% increase in the U.S. population between 1985 and 2000.	Utilization rates will change due to population growth and changes in prices, health insurance, and other non-price factors. Recent trends in these factors will continue. Coinsurance rates (percentage of total cost paid by consumer) will continue to decline.
Treatment of demand for medical specialties	Projections of utilization of 13 specialty groups are explicitly stated.	Projections of requirements by specialty are implied but not explicitly provided. The requirements model developed by the Bureau of Health Professions considers eight categories of physicians and 20 other types of health personnel.

*NMCUES = National Medical Care Utilization and Expenditure Survey. NHIS = National Health Interview Survey.

†Utilization rates are defined as per capita utilization by each population group.

Specialty Requirements

A major difference between the two studies is in the amount of detail provided about physician requirements by specialty. In the HRSA report, the projections of physician requirements are not broken down by specialty, although the Bureau of Health Professions' model used in the HRSA report provides for estimating requirements in eight specialties.[4] This absence of detail is understandable because the HRSA report covers 20 types of health personnel in addition to physicians.

Since AMA's report concerns physicians only, it is able to provide both supply and utilization projections for 13 specialty groups.

Conclusions

The HRSA summarizes its projections for physician supply and requirements in Table 3, which shows an excess of supply over requirements now and for the next 30 years. But the HRSA report also cites a Robert

Table 3

HRSA Estimates of the Supplies of and Requirements for Allopathic and Osteopathic Physicians in 1986 and Projections to 1990, 2000 and 2020*

	1986	1990	2000	2020	Percent Increase 1986–2000
Supply	544,830	597,040	708,600	820,810	30.1
Requirement	—	570,500	637,000	758,500	19.1
Excess of supply over requirement	—	26,540	71,600	62,310	—

*Health Resource and Services Administration, Bureau of Health Professions (BHPr): supply forecasts are from the BHPr Supply Model basic series of estimates; requirement estimates are from the BHPr General Requirements Model.

Wood Johnson survey[5] that concluded that between 1982 and 1986 access to medical care deteriorated among the poor, minorities, and uninsured, especially those in fair or poor health. It is not clear to what extent, if any, the HRSA's requirements projections include an adjustment to correct for this decline in access.

The AMA's projections are shown in Table 4. In this model, pediatrics and the medical subspecialties will experience the fastest growth in supply relative to utilization, while for general surgery the supply will change hardly at all. Utilization of general/family practitioners and psychiatrists is also projected to increase faster than supply. But because there is evidence that current utilization rates are not optimum, the AMA declines to conclude that there will be any surpluses or shortages.

These AMA projections are in the same general direction as the HRSA's, and the AMA also believes that many adjustments could occur to bring the growth rates in supply and utilization closer together. Prices of services and the incomes of physicians in the fastest-growing specialties may decline, thus slowing the growth of those specialists. Changes in medical technology could radically change utilization patterns, and more importantly — as acquired immune deficiency syndrome (AIDS) has shown — the incidence and prevalence of disease are not stable over time and can cause changes in the demand for physicians' services.

Commentary

The AMA and the HRSA are to be commended for producing thoughtful studies of a complex set of issues. Their reports deserve serious review and consideration. They continue to advance the state of the art in modeling physician supply and demand that was established by the pioneering GMENAC effort in 1981.

It is becoming clearer that the supply side is easier to model than the demand side because the former involves less stringent data requirements and fewer factors to consider (although the distribution of physicians by specialty and geography are issues needing further attention). On the requirements side, the HRSA's attempt to adjust for changes in insurance coverage is on the right track — programs such as Medicare and Medicaid are likely to have an even greater impact on the cost and access issues in the future. But the HRSA clearly should provide better documentation of its requirements model and the adjustments made to utilization rates.

The differences between the two studies involving the current supply of physicians, data on FMGs, and attrition rates are matters of interpreting actual data from the same source and ought to be resolved by discussions between the organizations.

As for interpreting the results, there are legitimate grounds for differences. The essential issue here is whether or not current utilization rates are optimum, and neither study claims that they are. If the acknowledged problems of the maldistribution of physicians and lack of access to adequate health care for certain groups were solved, would there still be a potential surplus? Perhaps that question could be addressed more explicitly in future studies.

Table 4

AMA Estimates of Changes in Projected Utilization and Supply of Allopathic Physicians 1985–2000*

	Percent Change in Utilization†	Percent Change in Supply‡	Difference in Percent Changes
All physicians	14.5	23.8	−9.4
Specialty			
General or family practice	13.0	9.9	3.1
All internal medicine	24.0	36.6	−12.6
General internal medicine	24.6	27.0	−2.4
Medical subspecialists	23.4	51.8	−28.4
All surgery	17.0	13.1	3.9
General surgery	16.5	0.5	16.0
Surgical subspecialists	17.1	19.9	−2.8
Pediatrics	7.0	38.8	−31.8
Obstetrics-gynecology	2.8	24.3	−21.5
Radiology	—	18.2	—
Psychiatry	19.4	14.0	5.4
Anesthesiology	—	41.7	—
Pathology	—	9.6	—
Emergency medicine	6.2	69.4	−63.2
Other specialties	14.8	18.1	−3.3

*Source: Marder, W., et al., *Physician Supply and Utilization by Specialty* (Chicago, Illinois: American Medical Association, 1988), p. 121.

†Total physician contacts excluding telephone contacts.

‡Total projected active physicians.

The author thanks Mr. Cultice and William Marder of the AMA for their reviews of and comments on this article.

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ESSAY

DEBORAH BOREK, M.D.

Unchanging Dilemmas in American Medical Education

Abstract—The author reviews "the lietmotiv of unresolved dilemmas" in American medical education: the problems of determining the premedical and medical school curricula and of selecting medical students. She offers suggestions for each area, but cautions that there are no simple answers. *Acad. Med.* 64(1989):240–244.

Those who take an interest in the evolution of American medical education will find a leitmotiv of unresolved dilemmas. In 1847, the American Medical Association (AMA) convention posed three questions regarding undergraduate medical education:

1. What is the best preliminary education for those intending to study medicine?
2. How can [the medical school curriculum] be improved?
3. What system of examination will best insure competence?[1]

These questions are still debated.

The Premedical Curriculum

There is no consensus as to what changes should be made in the premedical curriculum, although there is unanimity in deploring the status quo. Proposed changes fall into two broad categories: those of the humanist-elitists, who call for a stronger liberal arts background, and those of the scientist-pragmatists, who would push molecular biology and computers. Lewis Thomas, predictably, is in the first camp. He contends that "the atmosphere of the liberal arts college is being poisoned by premedical students" and suggests that "any applicant who is self-labeled as a 'pre-med,' distinguishable by his course selection from his classmates, should have his dossier placed in the third stack of three."[2] He would make one discipline mandatory for all college students, to place them on a common footing and develop their intellectual abilities: classical Greek, which Thomas would restore "as the centerpiece of undergraduate education."

He writes that not only would the college students benefit from this policy: "Perhaps benefiting the most of all are the basic-science faculties of the medical schools, who would once again be facing classrooms of students who are ready to be startled and excited by a totally new and unfamiliar body of knowledge, eager to learn, unpreoccupied by the notions of relevance that are paralyzing the minds of today's first-year medical students already so surfeited by science that they want to start practicing psychiatry in the first trimester of the first year."

I'm not so sure about Lewis Thomas. I think he just wants to shock or amuse us. And his argu-

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Dr. Borek is assistant professor, Department of Pathology, School of Medicine, The University of Kansas Medical Center, Kansas City.

groups at the end of the workshop was felt by many to be unnecessary. Thus, this year there will be 12 groups (with 13 in each group) meeting three times for an hour each, with no summary meeting. Thus, 12 faculty members will each be involved as discussion leaders for three hours.

Although student evaluation of the project was not solicited (an oversight to be corrected next time), several students remarked informally that the assignment caused students to discuss ethical issues among themselves and to become aware of these problems. Since they had to locate a "good case" to write about, there was a natural tendency to ask each other what they thought about particular cases, and it appears that "ethics" became the center of a great deal of lunch-time and social conversation. In spite of this type of collaboration, apparently only twice were the same patients referred to in more than one study. A great deal of effort appears to have gone into these studies, in spite of the fact that names were checked only to see whether the case studies had been done at all, and nonparticipation affected only the workshop examination grade. Thus, although it is hard to determine whether the students' skills in the area of medical ethics have improved because of this project, it seems safe to say that their interest in medical ethics has.

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SHORT PAPERS

RICHARD L. HOLLOWAY, Ph.D., KATHRYN L. HALE, M.L.S., and
ROBERT E. RAKEL, M.D.

Academic Promotion and Tenure in U.S. Family Medicine Units

Abstract—The authors interviewed by telephone the heads (or their representatives) of 101 of the 120 family practice units in U.S. medical schools in 1987. Each respondent was asked for his or her personal perceptions of the relative importances of research, teaching, patient care, and administrative activities in the academic promotion process. Respondents were also asked for their views of their units' and institutions' perceptions of the importances of the same four activities in the promotion process, as well as other related questions about promotion and tenure. The findings indicate that there is still a significant incongruence between the value structure of most family practice units and that of their institutions but that many family practice units are beginning to achieve parity of promotion and tenure with other departments in their institutions. *Acad. Med.* 64(1989):270–272.

Promotion to associate professor with tenure has numerous implications for the individual faculty member; the departmental implications are equally important. These implications are strong for faculty and departments of family medicine, a specialty that formally began in 1969 and is striving to survive in academic medicine. Existing studies of promotion and tenure in family medicine have shown that research productivity (that is, publications) is the key factor in promotion and tenure decisions.[1,2] Family medicine has had difficulties establishing a firm research base—many of its teachers question the need for research in a practice-based discipline; others cite teaching or supervising schedules or lack of training as barriers. What is clear is that family medicine faculty must share the values of productivity of their institutions to achieve an established base.[3]

Family medicine has taken some major steps toward academic survival, having achieved full departmental status in 108 U.S. medical schools.

Dr. Holloway is associate professor and research director, Ms. Hale is research assistant, and Dr. Rakel is professor and chair, Department of Family Medicine; Dr. Rakel is also associate dean for academic and clinical affairs; all are at Baylor College of Medicine, Houston, Texas.

Correspondence and requests for reprints should be addressed to Dr. Holloway, Baylor College of Medicine, Department of Family Medicine, 5510 - Greenbriar, Houston, TX 77005.

Federal funding programs have been established for undergraduate medical education, residency education, faculty development, and the establishment of departments. The National Institutes of Health has established training programs for new researchers in family medicine in the hope that newly trained fellows will be better prepared to compete for promotion and tenure in the future. To determine the current state of the discipline regarding promotion and tenure, we conducted a survey of all heads of family medicine units in U.S. medical schools during the summer of 1987.

Method

Of the 137 U.S. medical schools and branches listed by the American Academy of Family Physicians, 120 had a family medicine unit in 1987 (108 full departments, 7 divisions, 5 sections). The other 17 schools reported no involvement in family medicine. We telephoned the chair, head, or designated contact person for each of the 120 schools involved in family medicine and were able to interview 101 (84%). Each respondent was asked for his or her personal perceptions of the relative importances of research, teaching, patient care, and administrative activities in the academic promotion process, as well as their views of their units' and institutions' perceptions of the importances of the same four activities in the promotion process. They also were asked to characterize the orientations of their parent institutions (on a continuum from research orientation to teaching orientation) and to state their opinions of whether their units, their colleges or schools, or their institutions had the strongest influence over the promotion and tenure process.

Results

The responses concerning the orientations of the parent institutions were relatively evenly distributed. The same number (18.8%) were considered to be research-oriented as were considered to be teaching-oriented, an additional 18.8% leaned toward a research orientation, 12.9% leaned toward a teaching orientation, and 30.7% were considered to be evenly balanced in their orientations to these areas. A large percentage of the unit heads (30.7%) claimed that the unit itself had the strongest influence over the promotion and tenure process; a larger percentage (53.5%) claimed that the college or school had the strongest influence, while 13.9% thought that the institution had the strongest influence. Two of the 101 responding unit heads did not answer this question.

The heart of the interview was a series of questions about the unit heads' perceptions of the relative importances of research, teaching, administration, and patient care to the promotion and tenure process. They were also asked for their perceptions of the units' and institutions' judgments of the importances of these factors to the promotion and tenure process. All the unit heads judged that the quality of research and publications was the most important criterion in promotion and tenure; they maintained that their units and institutions held the same view. Sheer numbers of publications was perceived to be a more important factor to institutions than to either units or unit heads. The significance of a faculty member's chosen research area was judged by all to be less important than quantity or quality of research or teaching.

The unit heads judged teaching, both quality and quantity, to be more important to promotion and tenure decisions than they felt the institutions did. Administrative contributions were uniformly judged to be the least important of all the criteria to

Table 1

Correlations and Coefficients of Determination of Ratings of the Relative Importances of Research, Teaching, Administrative, and Patient-Care Activities in Decisions Concerning Promotion and Tenure of Family Practice Faculty Members*

Activity and Institutional Categories	Institutional Categories		
	Head	Unit (Department, Division, or Section)	Institution
Research† ‖			
Head	1.00	.69§	.09
Unit	.83‡	1.00	.08
Institution	.30	.28	1.00
Teaching†			
Head	1.00	.64§	.12
Unit	.80‡	1.00	.25
Institution	.35	.50‡	1.00
Administration†			
Head	1.00	.41	.35
Unit	.64‡	1.00	.34
Institution	.59‡	.58§	1.00
Patient care† ‖			
Head	1.00	.79‡	.48
Unit	.89‡	1.00	.46
Institution	.69‡	.68‡	1.00

*Ratings were made by the authors after they interviewed 101 unit heads (or designated representatives) and asked them their personal perceptions — and their views of their units' and institutions' perceptions — of the importances of the four activities in decisions concerning promotion and tenure. Responses to these questions were obtained from 87 unit heads regarding research, 91 regarding teaching, 88 regarding administrative activities, and 89 regarding patient care.

†For each of the four activities, the numbers below the "1.00" in each column are the correlations and those above are the coefficients of determination.

‡$p < .001$.

§r^2 (coefficient of determination) ≥ .50.

‖This is a composite of ratings for both quality and quantity.

promotion and tenure decisions. Amount of patient care was judged fairly important to unit heads but not important to the institutions, while quality of patient care was judged to be of much greater importance by all three.

Overall, these results suggested that there were real differences between the units and unit heads on the one hand and their parent institutions on the other in perceptions of the importances of some of the criteria. To test this hypothesis empirically, composite scores were correlated between and among the levels of importance of promotion criteria viewed by the unit heads and the levels perceived by the unit heads to be the views of their units and institutions (Table 1). The coefficient of determination was also calculated for each correlation (by squaring the correlation). Overall, there was substantial correlation between the perceptions of the unit heads and the units, and significantly less correlation between the perceptions of either of these two groups and those of the institutions. This pattern was more pronounced in the agreement among the three groups on the lesser importance of administration.

The results of the questionnaire indicate both important progress for family medicine and some disturbing trends. That 85.1% of the responding units had achieved departmental status is an encouraging sign, for it indicates a level of stability and entrenchment undreamed of in 1969. Furthermore, 85% reported that at least one member of their faculty had achieved tenure. Almost a third (30.7%) of the units claimed to have the greatest degree of influence over the promotion and tenure process, an important indicator of the maturity of these units.

Based on our data, there is still a significant incongruence between the value structure of most family practice units and that of their institutions. Studies of academic productivity suggest that productivity is greatest in those units whose members identify most closely with the value structure of their parent institutions.[3] The present study suggests that many family medicine units are beginning to achieve parity (as measured by any standard criteria) with other departments in their institutions, adhering to the value structures of their institutions without sacrificing their own. Apparently many family medicine units are finding that the development of a research agenda in family medicine may not necessitate abandoning family medicine's primary commitment to patient care and quality teaching. It may even be the case that one day, family medicine will test its own values using the traditional methods recognized by academic medicine.

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ACADEMIC MEDICINE

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RESEARCH REPORTS

ARTICLES

A Practice Profile of Native American Physicians

TIMOTHY L. TAYLOR, M.P.H., Ph.D.

Abstract—Native American physicians constitute less than 0.5% of the overall U.S. physician supply. Little is known about their professional practices in terms of location, specialty, practice setting, and amount of time allocated to professional activities. The Association of American Indian Physicians, AAIP, is a professional organization of physicians, each of whom is at least one-eighth American Indian. A survey of its 109 members in 1987 elicited 84 responses. The findings indicate that most respondents were American Indians to less than one-quarter degree, and although they were practicing in locations where large numbers of Indian people reside, 65% reported that less than 25% of their direct patient care activity involved Indian patients. In regard to Native American physicians, the survey findings and other published information contradict the view that minority medical practitioners are more likely than their white counterparts to practice in areas where large numbers of their respective minority populations reside and will, therefore, provide medical care to significant numbers of their respective minority populations. *Acad. Med.* 64(1989) 393–396.

Information about the number of Native American physicians* and the locations and types of their practice settings is incomplete. The primary sources of information about minority health manpower are government reports, which are often based on U.S. Bureau of the Census estimates. These and other reports generally conclude that minority practitioners provide a great deal of medical care to numbers of their minority populations.[1-3] Such reports, however, are replete with disclaimers about their data, especially when it pertains to Native American health professionals. These disclaimers reflect the surprisingly low representation of Native American people in the major health professions. According to the Census of 1980, Native Americans made up less than 1% of the total U.S. population, and less than 0.5% of the total U.S. population of physicians. This available information about Native American physicians is based on sample estimates. Hence, the large sampling error associated with small numbers—such as those that represent the Native American population and the population of Native American physicians—and the effects of even small numerical differences on the ratios and percentages computed by the Census Bureau, make drawing conclusions about Native American physicians particularly risky.[1]

Nevertheless, the Census Bureau has reported there were 510 civilian Native American physicians employed in 1980. As late as 1978 and 1979, published "guesstimates" of the total number of Native American physicians were between 125 and 175.[4,5] According to information produced by the Association of American Medical Colleges, during the period 1969 through 1980 there have been 222 Native American graduates of U.S. Schools of Medicine.[6]

It was also reported by the Census Bureau[1] that Native American physicians were located in the South and West. Although the West and the South Central area of the South are areas of the country where significant numbers of Indian† people reside, there are important differences between the distribution of Native American physicians and that of the Indian population. For example, the Census Bureau reported that "Indian physicians were not as likely as the Indian population to locate in the Mountain Division of the West, but were nearly two to three times more likely than the population to reside in the South Atlantic, East South Central, and Middle Atlantic Divisions." Yet, "even in the Middle Atlantic Division, where Indian physicians were three times more likely to reside than the Indian population, the number of

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Dr. Taylor is assistant professor, Department of Health Administration, College of Public Health, University of Oklahoma Health Sciences Center, Oklahoma City, and national director of Improving the Health of Native Americans, a program supported by The Robert Wood Johnson Foundation. Dr. Taylor is a member of the Kiowa Tribe of Oklahoma.

Correspondence and requests for reprints should be addressed to Dr. Taylor, Department of Health Administration, College of Public Health, University of Oklahoma Health Sciences Center, P. O. Box 26901, Oklahoma City, OK 73190.

*Medical education and medical care of American Indians are considered from various points of view in this issue. In addition to this article, see the Commentary, "Native Americans in Medicine: The Need for Indian Healers," (page 388); the article, "Predicting and Fostering Success of American Indians in Medical School" (page 396); and the Data Report (page 418).

†In this paper, the terms "Native American," "American Indian," and "Indian" are used interchangeably.

Indian physicians per 100,000 Indian population was only 94, as compared with 230 white physicians per 100,000 white population in that Division. In most other geographic areas, the ratio of Indian physicians to the Indian population was substantially below the ratio observed in the Middle Atlantic Division."[1]

An additional caveat about Census Bureau information concerns the self-identification process used by respondents to Census Bureau surveys. The Native American population is the only American minority group for which blood quantum levels must be established for tribal membership (for most federally recognized Indian tribes) and for federal benefits, such as higher education grants from the Bureau of Indian Affairs. (Blood quantum level refers to the degree of "Indian blood" an individual may possess as a result of parents who are not "full-blood Indians," or when only one parent is Indian, or when the parents are from different tribes.) Although the Census of 1980 reported the total Indian population to be 1.4 million, almost 7 million Americans claim American Indian ancestry.[7] Reasonable concern exists about the blood quantum levels and tribal membership levels of the 510 Native American physicians estimated to practice in the U.S., as well as recent Native American graduates of U.S. medical schools.

The difficulties associated with conducting a comprehensive survey of Native American physicians are immense. The only organization in the United States that routinely gathers and updates information about Native American physicians is the Association of American Indian Physicians, AAIP. Established by a group of prominent Native American physicians in 1971, AAIP has focused its activities primarily on the recruitment, admission, and retention of Native American medical students. The present report is based on a survey of 84 Native American physicians who are members of AAIP. Because a relatively small number of physicians were surveyed, the results of the study may not be viewed as representative of the total population of Native American physicians; nevertheless, these findings help to fill an important information gap.

Method

In late 1986, a postcard questionnaire was sent to 124 members of the AAIP to verify mailing addresses. At the same time the president of the AAIP sent personal letters to the members announcing the survey and requesting their participation. The mailing addresses of 109 AAIP members were confirmed by returned postcard.

Shortly thereafter, a six-page questionnaire was sent to each of the 109 AAIP members who had responded to the postcard questionnaire. Most of the six-page questionnaires were returned during the late summer and autumn of 1987; a total of 84 (77%) were received. Although most AAIP members returned their questionnaires, not all members responded to every question. Thus, not all the findings are based on responses from the same number of physicians.

The questionnaire was composed of two parts. Part I dealt with aspects of professional practice, such as location, licensure, specialty, practice setting, and amount of time allocated to professional activities. Respondents were also asked to indicate the proportion of their direct patient care time devoted to Medicare (or Medicaid) and Native American patients. Part II dealt with issues and problems related to medical education and training and to establishing a practice. In addition, descriptive information, such as age, gender, and Indian blood quantum level, was also requested. This report describes the findings of Part I of the survey, which provided a practice profile of the Native American physicians who responded.

Findings

The average age of respondents was about 42 years; men outnumbered women 68 to 16. Fifty percent of the respondents were less than one-quarter Indian; five respondents were "full-blood" Native Americans. Most respondents were located in the U.S. West and South, particularly in the Pacific Division of the West and the South Central Division of the South. Specifically, there were 19 respondents located in the Pacific and West South Central census divisions; 12 located in the Mountain Division; 11 located in the South Atlantic Division; 10 located in the West North Central Division; 4 located in each of the East North Central, Mid-Atlantic, and New England Divisions, and one located in the East South Central Division.‡ Almost 40% of the respondents were family practitioners, followed by surgeons (18%), those who indicated medical specialties (16%), and psychiatrists (11%). Of those who responded, the largest proportion were in private practice (25%). Fifteen respondents (21%) reported their employment position to be that of staff physician, 13 (18%) were residents, 13 others were medical or clinical directors, eight (11%) were medical school faculty, and five respondents indicated other employment positions.

Forty-four of 70 respondents reported they allocated over 40 hours per week to direct patient care. Eighteen respondents reported they allocated more than 60 hours per week to direct patient-care activities. Almost half (47%) of the responding physicians indicated that 25% or less of their direct patient care time involved Medicare or Medicaid patients. Thirty-two percent of the respondents reported they allocated more than 25%, but less than 50%, of their direct patient care time to Medicare or Medicaid patients. Almost 21% of the respondents reported they allocated more than 50% of their direct patient care time to Medicare or Medicaid patients.

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‡States are assigned to census regions in the following way: Pacific: Alaska, California, Hawaii, Oregon, Washington; Mountain: Wyoming; West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota: West South Central: Arkansas, Louisiana, Oklahoma, Texas; East North Central: Illinois, Indiana, Michigan, Ohio, Wisconsin; East South Central: Alabama, Kentucky, Mississippi, Tennessee; South Atlantic: District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia; Mid-Atlantic: Delaware, New Jersey, New York, Pennsylvania; New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.

In terms of the delivery of health care to Native American patients, 85% of the respondents reported that 25% or less of their direct patient care time involved Native American patients. Six respondents (11%) indicated that between 25% and 75% of their direct patient care time was allocated to Native American patients. Eleven respondents reported all their patients were Native Americans.

Table 1 presents an overview of these findings.

Discussion

Since this practice profile of Native American physicians is based on survey information that is not representative of all Native American physicians, statistical analyses to compare findings with characteristics of other groups of physicians would be inappropriate. However, the findings of the survey reported here may be placed in better perspective if described within the context of similar published information about other groupings of physicians, Native American physicians, and the professional activities of all these groups. For example, 19% of the respondents to the survey of Native American physicians were women. This does not appear to be an accurate reflection of the actual distribution of Native American men and women in the medical profession. In 1972, 1978, and 1984, women were 24%, 27%, and 37% of the total native American enrollment in all U.S. medical schools, respectively. In 1984, women were over 50% of the total first-year Native American enrollment in all U.S. medical schools.[8]

Table 1

Profile Characteristics of Native American Physicians, the Association of American Indian Physicians, 1986–1987*

Characteristic	No. of Respondents
Specialty area (*n* = 84)	
Family medicine	32
Surgical specialties	15
Medical specialties	14
Psychiatric specialties	9
Pediatrics	5
Obstetrics/gynecology	3
Hospital-based specialties†	3
General practitioner	2
Other specialties	1
Type of practice or position (*n* = 72)	
Private practice	18
Staff physician	15
Resident	13
Medical/clinical director	13
Faculty	8
Other	5
Hours in average week allocated to direct patient care (*n* = 70)	
20 or less	10
21 to 40	16
41 to 60	26
61 to 80	9
More than 80	9
Percentage of direct patient care allocated to Native American patients (*n* = 54)	
25 or less	35
26 to 50	4
51 to 75	2
76 to 100	13

*Results of a survey of 109 members of the Association; 84 members replied. Not all findings are based on responses from the same number of physicians, because some physicians did not respond to certain questions.

†Includes anesthesiology, pathology, and diagnostic and therapeutic radiology.

According to 1980 Census Bureau information, there were 35 Native American physicians per 100,000 Native American population. This compares to 50 black, 129 Hispanic, and 198 white physicians per 100,000 members of the black, Hispanic, and white populations, respectively.

In terms of the location of Native American physicians by census region, most are located in the Northeast Region (80 per 100,000 Native Americans), particularly in the Mid-Atlantic Division (94 per 100,000). The concentration of Native American physicians in this census division does not support the view, cited at the beginning of this paper, that minority physicians, in this case Native American physicians, practice in locations where large numbers of Native Americans reside. According to census information, two regions that have large numbers of Native Americans, the West Region and the North Central Region (especially the West North Central Division) have the lowest numbers of Native American physicians (25 and 27 per 100,000, respectively). Many Native American physicians (80 per 100,000) appear to reside in the East South Central Division of the South Region, composed of Alabama, Kentucky, Mississippi, and Tennessee, yet only 1.5% of all U.S. Native Americans reside in these four states. On the other hand, 25.6% of all Native Americans reside in the Mountain Division of the West Region, were there are 12 Native American physicians per 100,000 Native Americans.

According to the survey findings of the AAIP membership reported here, most respondents were located in the Pacific, West South Central, Mountain, South Atlantic, and West North Central Census Divisions. Seventy-one of 84 respondents (84.5%) were located in these census divisions, where 85% of the total U.S. Indian population reside. In the Pacific and West South Central Census Division of the U.S., where 25% and 16% of the Native American population live, respectively, 38 (45%) of the respondents practice.

Of 73 respondents, 18 indicated they were in private practice. Seventy-five percent of the respondents were in salaried positions. Nationally, in 1985 almost 26% of all physicians were employees of organizations.[9]

In 1985, self-employed physicians averaged 52.6 hours per week in their patient care activities; employee physicians averaged 46.6 hours per week.[9] Respondents to the present survey averaged 52.47 hours per week in their patient care activities. Over 25% indicated they averaged over 60 hours per week in their patient care activities.

In a 1985 study, all U.S. physicians reported that 35.2% of their patient care visits were made by Medicare patients.[9] Respondents who participated in the present survey reported 18.2% of their patient care visits were made by Medicare or Medicaid patients, and 11 respondents (20.7%) reported over 50% of their patient care time was allocated to Medicare or Medicaid patients.

Perhaps the most revealing aspect of the practice profile of AAIP physicians is their response to the question asking them to report the percentage of direct patient care delivery time they allocated to Native American patients. Thirty-five of the 54 physicians responding (65%) reported they allocated 25% or less of their direct patient care delivery time to the delivery of health care to Indian patients. Eleven of the respondents (20.3%) indicated 100% of their patients were Native Americans.

As noted earlier, government reports have indicated that Native American physicians are not distributed in locations where large concentrations of Indian people reside, and given the relatively small size of the overall Native American population, they probably do not have many Indian patients. The survey findings of AAIP members seem to support this general conclusion. It is most important to note that these findings regarding Native American physicians do not, however, support the widely held view that physicians "from each racial/ethnic minority group [are] much more likely than white practitioners to reside in areas in which significant percentages of their respective population group [reside]."[1] Since certain aspects of many Native American tribal cultures impede access to and/or delivery of modern medical care services, it is as important, if not more important, for Native American physicians to practice among Native Americans as it is for black and Hispanic physicians to practice among blacks and Hispanics, respectively. Moreover, in spite of the fact that there are so few Native American physicians, this discussion begs the question, "Why aren't more Native American physicians providing medical care to their own people?" This is a suitable question upon which to base additional study.

The author acknowledges the generous assistance of Mr. Terrence Hunter, Executive Director of the Association of American Indian Physicians, without whose support and cooperation this Indian physician practice profile could not have been completed.

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Predicting and Fostering Success of American Indians in Medical School

LYNN A. KERBESHIAN, Ed.D.

Abstract—Underrepresentation of minorities continues to be a significant problem for medical schools. Although schools are considering nontraditional selection factors in an attempt to redress imbalances in admissions, little is known about the criteria that predict success for minority students who enroll. American Indian medical students at the University of North Dakota School of Medicine were surveyed concerning quantitative and qualitative variables. They scored significantly lower than non-Indian students, but there was no difference in terms of traditional admissions criteria between the Indian students who withdrew and those who graduated. Students who withdrew were slightly younger, had more siblings, and had attended reservation schools. Problems noted by students included poor academic preparation, excessive family responsibilities, and encountering cultural misperceptions. An overview of these problems and recommendations for solving them are presented. *Acad. Med.* 64(1989):396–400.

highly visible. There is pressure on the student and the faculty to get students through to meet somewhat arbitrary graduation and residency deadlines. If more students were taking decelerated or optional enrichment programs, this pressure would not be so great.

Special programs for minority students need to be individually designed, with a variety of options within the group framework. Easing some of the everyday hassles and burdens that can become overwhelming when students are stressed and pushed to their limits can be invaluable. Such efforts would include helping with finances, recreation, spouses, children, and extended family. Having someone available to talk to about problems — personal concerns, prejudice, and attitudinal changes — can be a great help, according to the students interviewed.

Minority programs can model successful integration with aspects of the majority culture, for example, mixing with faculty, using other services within the community, and establishing contacts with the health professions organizations in the state. A coordinated effort by students, faculty, administration, and the program, using all available resources, is most likely to meet long-range and immediate goals for helping medical students from Indian and other minority groups to become physicians.

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Practice Locations of Texas Family Practice Residency Graduates, 1979-1987

DAVID R. DENTON, Ph.D., JOHN H. COBB, and WILLIAM A. WEBB, Ed.D.

Abstract—The location of a physician's residency training is known to be a factor in selection of a practice location. In this paper, the authors analyze the practice locations of 689 family physicians who graduated from residency programs in Texas between 1979 and 1987 and who were practicing in Texas in 1988. One-third of these graduates were practicing in cities the same size as their residency program city. More than half were in counties located within 60 miles of the residency city. Both of these trends can be explained to a large degree by the fact that a high percentage of graduates remained in their residency city to practice. When these nonmobile graduates are removed from the sample, the findings show no correlation between the size of the residency city and the size of the practice city. More than two-thirds of those graduates who left their residency city were in counties beyond a 60-mile radius. Almost two-thirds were practicing in communities of less than 25,000 population. The authors conclude that state support for family practice residency training has been effective in distributing family physicians in a manner that addresses the needs of the state of Texas as a whole. *Acad. Med.* 64(1969):400-405.

The literature on factors affecting physicians' practice location decisions has expanded dramatically in recent years. A wide range of factors, from opportunities for partnerships to career opportunities for nonphysician spouses, have been found to influence selection of a practice location.[1] In general, however, two principal factors have been found to correlate consistently with practice location — the nature of the community in which the physician was reared[2-11] and the nature of the community in which the physician's residency was completed.[1,2,11-15] In addition, a number of authors have found evidence that family practitioners are more likely than are members of other specialties to locate in nonme-

Dr. Denton is director, Health and Human Services, the Southern Regional Education Board, Atlanta, Georgia; Mr. Cobb is a consultant on population and enrollment projections and planning for higher education, and Dr. Webb is assistant commissioner for financial planning, both with the Texas Higher Education Coordinating Board, Austin, Texas.

Correspondence and requests for reprints should be addressed to Dr. Denton, Southern Regional Education Board, 592 Tenth Street, NW, Atlanta, GA 30318-5790.

tropolitan areas.[5,15,16]

In 1978, in response to growing shortages of physicians in rural areas of Texas and with the strong support of the Texas Academy of Family Physicians, the Texas state legislature established the Texas Family Practice Residency Training Program. Through this program, state funds were provided to help support family practice residency programs at a level that consistently has averaged 15–20% of each program's operating costs. The objectives of the program were twofold — to replenish the dwindling supply of general and family practitioners in Texas and to improve the distribution of primary care physicians in the state, especially in the extensive, often sparsely populated, rural areas. From 13 programs with a total of 267 residents in 1978, the Texas Family Practice Residency Training Program has grown to include 25 programs and 479 residents in 1989. All family practice residency programs operating in the state receive state funding. Family practice is the only area of specialty training for which this is the case. The Texas Higher Education Coordinating Board (CB) is responsible for administering the family practice residency grants.

In order to provide the state legislature with information regarding the success of the family practice program in accomplishing its goals, staff of the CB developed a computerized system for tracking program graduates. Because this is a state program designed specifically to address the needs of Texas, the focus of the tracking system has been on graduates practicing or licensed to practice in Texas. The system does not include information about the personal backgrounds of family practice graduates; historical information for each graduate goes back only as far as identification of the medical school. Nevertheless, the tracking system is sufficiently comprehensive, and the number of graduates to date sufficiently large, that an analysis of practice locations can provide meaningful information to assess the wisdom of the legislature in choosing to support family practice residency training as its foremost strategy for addressing problems of geographic maldistribution.

Method

The tracking system for graduates of Texas family practice residency programs is based on the data-base model of the Texas State Board of Medical Examiners (BME). The CB file on each graduate of a state-supported family practice residency program includes that person's Texas medical license number, Social Security number, mailing and practice addresses, sex, first and second specialties, medical school, year of graduation, type of degree (M.D. or D.O.), primary activity, and setting (reflecting only federal employment or enrollment in a further residency or fellowship program). In addition to these items maintained for licensure purposes, the file identifies the graduate's family practice residency program, the year it was completed, the Texas county of practice, and a code categorizing the size of the practice city.

Files on individual graduates are first compiled in the fall of each year on the basis of information provided by each residency program for its current graduates. While this information is often incomplete, it includes certain key variables — most notably name, Social Security number, medical school and year — that permit subsequent matching with licensure data with a high degree of accuracy. The file is updated each spring with a master file provided by the BME. Special programs are run to match key variables for graduates not identified on the initial match by their Texas license numbers. Reports also are generated indicating any changes in other information for matching license numbers. The CB elements are then manually updated on the basis of changed BME data, especially regarding practice county and city. Since Texas physicians renew their licenses annually on a staggered schedule throughout the calendar year, the BME data include some obvious margins for error. It is conceivable, for example, that a physician could renew 11 months prior to the updating of the CB file and move a month later. The updated address would then be ten months out of date. At one time, efforts were made to correct for such slippage by asking each residency program to verify information on their graduates. Unfortunately, the quality of information about their graduates maintained by residency programs varies from exceedingly accurate to largely accidental. As a result, we decided that the BME data, checked and corrected for obvious inconsistencies such as misspellings of personal or place names, represented the most statistically defensible information available for graduates practicing in Texas. Information obtained from individual residency programs is used to update only the files of graduates who have not renewed their Texas medical licenses within the past year.

For purposes of the present study of practice location decisions, we determined that only those graduates meeting the following specific criteria would be included.

The sample was limited to physicians who had completed their family practice residency training between 1979 — the year of the first class of residents supported by state funds — and 1987 — the most recent class at the time of this study whose members' CB files were updated against BME data.

The particular concern of this study was with graduates who had made a voluntary decision to practice medicine in a location in Texas (as opposed to a military or public health service assignment in the state). Therefore, we included only those graduates who reported that their practice addresses were in Texas, that their primary activity was either direct patient care or medical teaching, and that family practice was their first specialty, and who did not report that their settings were in federal facilities or that they were students in other residency programs or fellowships. (We regarded the decision to accept a faculty appointment in a Texas family practice residency program as a voluntary practice decision, since at least part of such faculty members' time is spent providing care to patients who are Texas residents. We recognized that adding this group of graduates would create a slight tendency to include more graduates practicing in larger metropolitan areas. The exclusion of those reporting that they were in other residency programs or fellowships may have left out some 1987 graduates who last renewed their licenses prior to completing their family practice residencies, even though they might have decided subsequently to enter practice in Texas.)

For those graduates meeting the established criteria, we used information on the CB files regarding the city and county of practice and the location of the residency program to determine the numbers of graduates practicing in the city where their residency program was located. We also identified those practicing in the county of their residency program but outside the residency city and those in counties located within 60 miles of the residency city. These counties were identified by drawing a circle with a scale radius of 60 miles from the center of the residency program city as indicated on an easily available Texas road map. Any county with its nearest border within or tangential to the resulting circle was regarded as being within 60 miles of the residency city. This means that some graduates were included in the 60-mile category whose practice locations were in fact much farther than 60 miles from the residency program city. (The maximum distance possible in this situation was 110 miles).

We also used the data regarding the size of the practice city to determine the numbers of graduates practicing in Texas cities in each of the seven population size categories represented in the CB files. (Populations were based on 1980 census data. More current population data might be expected to have the effect of moving additional cities toward the upper and lower extremes of the range. The seven size categories used were arbitrarily determined at the time the data base was created, to reflect generally accepted in-state perceptions of groupings of Texas cities by size).

Finally, we looked at both proximity to residency and size of practice city again, using a reduced sample that excluded graduates practicing in the city of their residency program. The purpose of these tests was to evaluate practice-location patterns for those graduates who overcame the attraction of the city where they completed their training and elected to move elsewhere in Texas. We recognized that this distinction might be compromised by graduates locating in suburban areas around the residency city, but we also recognized that many of the residency cities are located in counties that contain distinctly rural communities.

Results

Between 1979 and 1987, Texas family practice residency programs produced a total of 1,033 graduates. Of that number, 689 (66.7%) met the criteria for inclusion in this study of graduates practicing in Texas.

Among these 689 graduates practicing in Texas, nearly one-third (30.9%) were found to be practicing in the city where they had completed their residency. Only 3.3% of this sample had moved to another city of comparable size to practice. Almost two-thirds (67.7%) of the graduates were practicing in cities that were not the same size as the cities of their residency programs. Testing for geographic proximity to the residency program city, we found that more than half (53.1%) of the sample were either in the residency city (30.9%) or in counties within 60 miles of that city (22.2%). When graduates remaining in the residency city were removed from the sample, only 12.2% of the remaining graduates were practicing in the county of their residency program. Twenty percent were in other counties within 60 miles of the residency city, while more than two-thirds (67.9%) had moved to counties beyond the 60-mile radius.

Looking at the distribution of the 689 graduates by size of city of practice shows that an impressive one in four (24.2%) were located in communities of less than 10,000 population, while another 19.7% were located in communities between 10,000 and 24,999 (Table 1). The next-largest group (18.3%) had located in cities of 500,000 and over, with 14.7% in cities between 200,000 and 499,999. None of the three city-size categories between 25,000 and 199,999 attracted as much as 10% of the sample.

When graduates practicing in the residency program city are removed from the sample, the distribution of graduates shifts downward significantly toward smaller communities. In the new sample, the percentages of graduates located in each of the four larger city-size categories are smaller, while those in the three categories of cities under 50,000 are larger. In this sample of graduates leaving the resi-

Table 1

Numbers and Percentages of 689 Graduates of Texas Family Practice Residency Programs between 1979 and 1987, Listed by the Population Size of the Texas City in Which They Were Practicing in 1988, and Numbers and Percentages of the 476 Graduates in This Group Not Practicing in the City of Their Residency Program

Size of Practice City	All Graduates in Practice in Texas		Graduates in Texas Not in Residency City	
	No.	Percent	No.	Percent
Under 10,000	167	24.2	167	35.1
10,000–24,999	136	19.7	135	28.4
25,000–49,999	38	5.5	38	8.0
50,000–99,999	66	9.6	36	7.6
100,000–199,999	55	8.0	24	5.0
200,000–499,999	101	14.7	33	6.9
500,000 and over	126	18.3	43	9.0
Total	689	100.0	476	100.0

Table 2

Numbers and Percentages of 689 Graduates of Texas Family Practice Residency Programs between 1979 and 1987, Listed by the Population Size of the Texas City in Which They Were Practicing in 1988 and the Population Size of the City in Which Their Residency Was Located

Size of Practice City	Size and Number of Residency Program Cities									
	10,000-24,999 (*n* = 1)		50,000-99,999 (*n* = 7)		100,000-199,999 (*n* = 3)		200,000-499,999 (*n* = 5)		500,000 and over (*n* = 6)	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Under 10,000	2	33.3	30	24.6	39	30.7	58	26.7	38	17.5
10,000-24,999	1	16.7	22	18.0	23	18.1	49	22.6	41	18.9
25,000-49,999	0	—	8	6.6	8	6.3	11	5.1	11	5.1
50,000-99,999	0	—	36	29.5	12	9.4	5	2.3	13	6.0
100,000-199,999	0	—	3	2.5	33	26.0	5	2.3	14	6.5
200,000-499,999	1	15.7	7	5.7	5	3.9	77	35.5	11	5.1
500,000 and over	2	33.3	16	13.1	7	5.5	12	5.5	89	41.0
Total	6	100.0	122	100.0	127	100.0	217	100.0	217	100.0
Total in Texas city same size as residency city	1	16.7	30	24.6	31	24.4	68	31.3	83	38.2

dency program city to practice elsewhere in Texas, 35.1% were located in cities under 10,000, 63.5% in cities under 25,000.

With a single exception, all of the residency programs included in this study are located in cities of 50,000 or more. Our data show that more graduates of these programs have located in cities in the same city-size category as the residency city than in any other city-size category (Table 2). The percentages of graduates in same-size cities range from 26% for those programs in cities between 100,000 and 199,999 to 41% for those in cities of 500,000 and over. The one program located in a city of less than 50,000 had too few graduates at the time of the study to provide meaningful data.

When we remove the graduates practicing in the residency city from our sample, these distribution percentages change dramatically (Table 3). For residency programs in every city-size category, more of the graduates who left their residency city located their practices in communities of under 10,000 than located in any other city-size category. The minimum percentage of these mobile graduates practicing in communities of less than 10,000 was 28.4% (for graduates of programs in the largest cities); the maximum was 40.6% (for graduates of programs in cities of 100,000-199,999). In every residency city-size category with meaningful numbers of graduates, well over half of all graduates leaving the residency city have located in communities of less than 25,000 (from a low of 56.5% of graduates of programs in cities of 50,000-99,999 to a high of 71.8% of those from programs in cities between 200,000 and 499,999).

The number of graduates who have chosen to practice in another city of the same size as the city where their residency program was located was

Table 3

Numbers and Percentages of 476 Graduates of Texas Family Practice Residency Programs between 1979 and 1987 Who in 1988 Were Not Practicing in the City of Their Residency Program, Listed by the Population Size of the Texas City in Which They Were Practicing and the Population Size of the City in Which Their Residency Program Was Located

Size of Practice City	Size and Number of Residency Program Cities									
	10,000-24,999 (*n* = 1)		50,000-99,999 (*n* = 7)		100,000-199,999 (*n* = 3)		200,000-499,999 (*n* = 5)		500,000 and over (*n* = 6)	
	No.	Percent	No.	Percent	No.	percent	No.	Percent	No.	Percent
Under 10,000	2	40.0	30	32.6	39	40.6	58	38.9	38	28.4
10,000-24,999	0	—	22	23.9	23	24.0	49	32.9	41	30.6
25,000-49,999	0	—	8	8.7	8	8.3	11	7.4	11	8.2
50,000-99,999	0	—	6	6.5	12	12.5	5	3.4	13	9.7
100,000-199,999	0	—	3	3.3	2	2.1	5	3.4	14	10.4
200,000-499,999	1	20.0	7	7.6	5	5.2	9	6.0	11	8.2
500,000 and over	2	40.0	16	17.4	7	7.3	12	8.1	6	4.5
Total	5	100.0	92	100.0	96	100.0	149	100.0	134	100.0
Total in Texas city same size as residency city	0	—	6	6.5	2	2.1	9	6.0	6	4.5

not significant. The maximum falling into this category is 6.5% of the graduates whose programs were in cities between 50,000-99,999.

Discussion

When the 689 graduates of Texas family practice residency programs (1979-1987) practicing in Texas are viewed as a whole, their selection of practice locations tends to bear out several previously noted trends. In 1988, a majority of these graduates were practicing in relatively close proximity to their residency city. Fifty-three percent were in counties within 60 miles of the residency city. A large proportion of the graduates—34.3% overall—were in cities the same size as their residency program city.

The tendency of graduates of family practice residency programs (or, for that matter, many other types of educational programs) to resist change and stay in the place where they finished their training might best be called the "inertia factor." When we corrected for this inertia factor by eliminating from our study the graduates who stayed in their residency city, the correlation between the size of the residency city and the size of the practice city disappeared. What emerged instead is an extremely strong tendency for family practice residency graduates to locate in communities that are generally much smaller than the ones where they completed their residency. Less than 5% of these mobile graduates chose to move to a city the same size as their residency city. Moreover, the trend to smaller communities cannot be explained to any significant extent by the numbers of graduates who located in smaller suburbs of their residency city, since only 12% of this group did in fact move from the residency city out into the same county.

Of particular interest in these data is the tendency for family physicians not to locate in the large middle range of cities between 25,000 and 199,999. Only 23.1% of all the graduates studied located in these cities, even though such cities offer a large number of choices, are widely perceived as being among the most "liveable" cities, and include within their boundaries 10 of the 22 residency programs that produced the graduates included in this study.

We believe these results have important implications for Texas and for decision makers in other states as they attempt to grapple with the problem of geographic maldistribution of physicians. They also raise questions not easily answered in the context of our available data.

First, it is clear, regardless of how the data are arranged, that state support for family practice residency programs has had the desired effect of moving large numbers of family practitioners out into the smaller communities that have suffered most from the increasing concentration of physicians in larger metropolitan areas. Even if we make the highly questionable assumption that most graduates outside their residency city but in the same county are in communities of less than 25,000 and then remove these from our calculations, still more than one-third of all the remaining graduates practicing in Texas and more than half of those leaving the residency county were practicing in cities of under 25,000 at the time of this study.

The questions arise when we look at the lower but still significant proportion of graduates practicing in larger cities and metropolitan areas—33% of all the graduates in Texas are in cities of 200,000 or more. On one hand, this tendency of the majority of graduates to locate in either the largest or the smallest communities in the state can be seen as desirable. The largest cities are more likely than those in the midrange to include census tracts designated as shortage areas for primary care physicians. Family physicians may well be more likely to serve such underserved urban areas than are members of other primary care specialties. Unfortunately, our existing data base does not allow us to match the locations of graduates practicing in urban areas with census tracts, so we cannot be certain that these urban family physicians are actually serving the shortage areas to any significant extent.

If, in fact, we were able to conclude that the number of graduates remaining in these large urban areas outstrips the need for new family physicians in these areas, we would then be faced with the dilemma of how to overcome the inertia factor. Every city in this 200,000-plus category has at least one residency program, and, as our findings show, the overwhelming majority of the graduates practicing in each of these cities were products of one of the city's own programs. Unfortunately, we do not have data that will tell us whether the graduates staying in their residency cities are products of urban backgrounds and those in smaller communities of rural backgrounds. Thus, we cannot know whether selective recruitment would alter the distribution pattern. There is a significant body of literature, however, that suggests strongly that this might be the case.[2-11]

It seems probable in any case, given the demographics of the U.S. population and the fact that a high percentage of graduates already are going into more rural areas, that a substantial number of those staying in their residency city are and will continue to be from nonrural backgrounds. If we determine that we do need to encourage more of this less mobile group of graduates to leave and establish practices in rural areas, some other strategy besides selective recruitment may be required. One option might be the development of a systematic method for providing all residents with significant experience in nonmetropolitan areas. Such a system of remote rural training sites might conceivably be built around the existing Texas Statewide Family Practice Preceptorship program, which currently involves almost 500 private practice family physicians in the state and reaches more than 500 preclinical and clinical medical students each year, and which is funded through the Texas Family Practice Residency Training Program. The logistics of any such program would clearly be complex and costly and are well beyond the scope of this paper.

In discussing these questions of whether to, or how we might, encourage more residents to overcome the inertia factor and move to smaller communities to practice, there is a further issue that must be considered that is essentially political. That is, state funds provide no more than about 20% of the total budget of Texas family practice residency programs. The largest proportion of funding for these programs — 60% of the average program's operating budget — comes from local sources, including both direct and in-kind support from affiliated hospitals and public hospital districts, local foundations, and, in the case of programs affiliated with medical schools, locally generated medical school funds. Yet, while providing more than half of the financial support to the programs, the metropolitan areas where they are located are getting back a much smaller proportion of program graduates. It might thus be argued that the midsize and larger cities where all but one of the Texas residency programs are located are already augmenting the state support that helps provide family practitioners in rural and smaller urban areas. This argument does not take into consideration, however, the large volume of medical services that the residency programs themselves provide directly to the midsize and larger communities in which they are located. Although this combination of services provided by the programs and graduates retained by the communities would be quite difficult to quantify, they may add up to a rough equilibrium between local support and local benefit. Viewed from that perspective, it might well be argued that the current distribution pattern of family practice residency graduates in Texas is almost optimal to adequately address the needs of the state as a whole for family physicians.

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The Educational Value of Community Preceptorships in Surgery

WILLIAM M. RAMBO, M.D., J. RICHARD SOSNOWSKI, M.D.,
H. BIEMANN OTHERSEN, Jr., M.D., and CAROL J. LANCASTER, M.S.

Abstract—Increasing class size provided the impetus to send students on the core surgery course at the Medical University of South Carolina College of Medicine into the community hospitals with members of the clinical faculty. Each student was assigned to a surgeon and accompanied this preceptor on rounds, in the operating room, and in the office. To determine whether the students' learning was affected by being outside the university, the authors looked at the experience from 1977 to 1986 with 683 surgery students who took community preceptorships and 696 surgery students who took only university-based rotations. The two groups were compared in regard to age, sex, basic science grade-point average, class rank at the end of the first two years in medical school, ward evaluations, grades on departmental final examinations, and National Board of Medical Examiners "mini-examination" scores and Part II surgery scores. No differences were found. Choices of specialty for the first postgraduate year and evaluations of program directors were reviewed for 1982, 1985, and 1986, and were similar for all three years. The preceptorship program has been popular with students, who stated that they valued the one-to-one relationship with surgeons who liked to teach. The program has relieved pressure on the university hospital system and provided a good learning experience for students. *Acad. Med.* 64(1989):405-407.

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AAMC DATA REPORT

Results of the NRMP for 1989

The number of U.S. seniors who enrolled in the National Resident Matching Program (NRMP) in 1989 decreased by 338 from a year ago[1] and was 741 less than in 1985,[2] when the number of U.S. seniors enrolled peaked. The number who subsequently withdrew increased by 23 (Table 1), but the number of active applicants decreased by 382. The number who were unmatched decreased by 101 (0.5 percentage point).

The total number of U.S. and Canadian citizens (U.S. seniors, "fifth pathway" students, physician candidates [earlier U.S. graduates who are seeking a position in graduate medical education], and osteopathic and Canadian graduates) who applied to the Match this year decreased by 123. Among the other U.S. and Canadian citizens, the number of "fifth pathway" applicants increased from 163 to 171; 131 participated in the Match, and 76% were successful. The number of graduates of osteopathic schools who initially applied to the Match increased by 114 to 1,272, almost a fivefold increase since 1983; 65% were matched. The number of physician applicants increased by 6 percentage points, and 47% were successful in the Match.

The number of U.S. citizen foreign medical graduates (FMGs) who applied decreased by 20 to 1,515, only slightly more than half of the number in 1984; 53% were successfully matched, an increase of 10 percentage points. The number of alien FMGs remained about the same at 4,094, and the percentage matched increased by 10 percentage points to 54%.

The number of positions offered for the first postgraduate year (PGY-1) increased by 442; 289 more were offered in the generalist specialties than in 1988 (Table 2). "Generalist" specialties are defined as family practice, internal medicine, obstetrics/gynecology, and pediatrics. The ratio of positions per initially enrolled applicants was 0.8; that of positions per all U.S. senior and other U.S.-Canadian citizen applicants was 1.0, an increase of .01 percentage point; and that per U.S. senior was 1.3, also a .01 percentage-point increase. The ratios for active applicants in the match were 1.0, 1.2, and 1.4, respectively.

The overall filling of PGY-1 positions decreased by 2.4 percentage points, the filling of positions by U.S. seniors by 3 percentage points, and the filling by other applicants increased by 0.6 percentage points. The number of U.S. seniors who were matched in family practice, internal medicine, and pediatrics decreased this year, and filling by U.S. seniors decreased. Pathology attracted 69 more seniors than last year. The most competitive programs were in emergency medicine, obstetrics/gynecology, orthopedic surgery, physical medicine, and radiology. The participation of programs and positions in psychiatry, orthopedic surgery, emergency medicine, and diagnostic radiology increased considerably. The small numbers of positions in neurological surgery, otolaryngology, plastic surgery, and urology are attributable to the participation of most of these programs in non-NRMP matches.

The distribution of matched U.S. seniors among types of programs decreased in family practice, internal medicine, pediatrics, obstetrics/gynecology, psychiatry, and general surgery, and the percentage of the class entering the support specialties increased.

An increased number of Advanced Programs for Students (PGY-2) positions were offered in the Match this year; 313 programs offered 1,536 positions, which were 71% filled by 1,092 U.S. seniors and 80% filled by 1,233 total applicants. One hundred fourteen programs in diagnostic radiology offered 423 PGY-2 positions, of

Table 1

Participation in the National Resident Matching Program in 1989

Category	U.S. Senior Students		Other U.S. and Canadian Students*		U.S. Foreign Graduates		Foreign-Born Foreign Graduates		Total Applicants	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total applicants	15,438	100.0	3,583	100.0	1,515	100.0	4,094	100.0	24,630	100.0
Withdrew	1,321	8.6	1,687	47.1	634	41.8	1,781	43.5	5,423	22.0
Active participants	14,117	91.4	1,896	52.9	881	58.2	2,313	56.5	19,207	78.0
Matched PGY-1	13,215	93.6	1,075	56.7	470	53.3	1,253	54.2	16,013	83.4
Unmatched PGY-1	902	6.4	821	43.3	411	46.7	1,060	45.8	3,194	16.6
Total	14,117	100.0	1,896	100.0	881	100.0	2,313	100.0	19,207	100.0

***Other U.S. and Canadian students consist of graduates from U.S. osteopathic schools and Canadian medical schools; physician candidates, that is, earlier U.S. graduates seeking a position in graduate medical education; and "fifth pathway" students, who are U.S. nationals who completed course requirements for a medical degree abroad followed by a year of clinical training in a U.S. hospital under medical school sponsorship.**

Table 2

Positions Offered and Filled by Types of Applicants in 1989

	PGY-1 Positions Offered		Applicants Matched												
			U.S. Senior Students			Other U.S. Applicants‡			Foreign-Born Foreign Graduates			Total Applicants		
				%			%			%			%	
Specialty	No.	%*	No.	*	†	No.	*	†	No.	*	†	No.	*	†
Family practice	2,456	12.3	1,468	11.1	59.8	216	14.0	8.8	61	4.9	2.5	1,745	10.9	71.1
Internal medicine	7,467	37.4	4,744	35.9	63.5	550	35.6	7.4	706	56.3	9.5	6,000	37.5	80.4
Pediatrics	2,063	10.4	1,256	9.5	60.7	156	10.1	7.5	242	19.3	11.7	1,654	10.3	80.0
Obstetrics/gynecology	1,061	5.3	883	6.7	83.2	100	6.5	9.4	24	1.9	2.3	1,007	6.3	94.9
Psychiatry	1,095	5.5	722	5.5	65.9	98	6.3	8.9	77	6.1	7.0	897	5.6	81.9
Medical specialties	72	0.4	45	0.3	62.5	4	0.3	5.6	4	0.3	5.6	53	0.3	73.6
Dermatology	9	0.0	9	0.0	100.0	0	0.0	—	0	0.0	—	9	0.0	100.0
Neurology	44	0.2	22	0.2	50.0	4	0.3	9.1	3	0.2	6.8	29	0.2	65.9
Ophthalmology	19	0.1	14	0.1	73.7	0	0.0	—	1	0.1	—	15	0.1	78.9
General surgery	2,218	11.1	1,532	11.6	69.1	141	9.1	6.4	51	4.1	2.3	1,724	10.8	77.7
Surgical specialties	632	3.2	547	4.1	86.6	50	3.2	7.9	2	0.2	0.3	599	3.7	94.8
Neurosurgery	33	0.2	23	0.2	69.7	3	0.2	9.1	1	0.1	—	27	0.2	81.8
Orthopedic surgery	462	2.3	415	3.1	89.8	41	2.7	8.9	1	0.1	—	457	2.9	98.9
Otolaryngology	50	0.3	40	0.3	80.0	2	0.1	4.0	0	0.0	—	42	0.3	84.0
Urology	79	0.4	63	0.5	79.7	2	0.1	2.5	0	0.0	—	65	0.4	82.3
Plastic surgery	8	0.0	6	0.0	75.0	2	0.1	—	0	0.0	—	8	0.0	100.0
Support specialties	1,598	8.0	1,108	8.4	69.3	171	11.1	10.7	34	2.7	2.1	1,313	8.2	82.2
Anesthesiology	293	1.5	200	1.5	68.3	9	0.6	3.1	5	0.4	1.7	214	1.3	73.0
Emergency medicine	376	1.9	297	2.2	79.0	56	3.6	14.9	2	0.2	0.5	355	2.2	94.4
Pathology	475	2.4	253	1.9	53.3	30	1.9	6.3	22	1.8	6.3	305	1.9	64.2
Physical medicine	89	0.4	84	0.6	94.4	2	0.1	2.2	0	0.0	0.0	86	0.5	96.6
Preventive medicine	10	0.1	2	0.0	20.0	0	0.0	—	0	0.0	0.0	2	0.0	20.0
Diagnostic radiology	344	1.7	262	2.0	76.2	74	4.8	21.5	5	0.4	1.5	341	2.1	99.1
Therapeutic radiology	10	0.1	9	0.1	90.0	0	0.0	—	0	0.0	0.0	9	0.1	90.0
Nuclear medicine	1	0.0	1	0.0	100.0	0	0.0	0.0	0	0.0	0.0	1	0.0	100.0
Transitional	1,288	6.5	910	6.9	70.7	59	3.8	4.6	52	4.2	4.0	1,021	6.4	79.3
Total	19,955	100.0	13,215	100.0	66.2	1,545	100.0	7.7	1,253	100.0	6.3	16,013	100.0	80.2

*Percentage distributions of positions offered and filled among specialties (percentages may not add to 100 due to rounding).
†Percentage of positions offered in specialty that were filled by applicants.
‡This category consists of those students listed in the footnote to Table 1 plus U.S. foreign medical graduates.

which 76% were filled with U.S. senior students and 17% with physician applicants, for a total filling of 93%. One hundred nine programs in anesthesiology offered 760 positions, of which 537 (71% were filled with U.S. senior students and 35 (4%) with other applicants, for a total of 75%. Ninety-one percent of these senior students were also matched to PGY-1 positions in the Match.

In the 1989 Match, 842 individuals participated as 421 couples; 96% of these U.S. students were successfully matched.

Several specialty matches for physician candidates were carried out by the NRMP in 1988. In the fall, 23 programs offered 50 positions in colon and rectal surgery; 100% were filled by 61% of the applicants. Late in the fall, 18 programs in emergency medicine offered 101 positions; 97% were filled by 48% of the applicants. In the specialty match for dermatology last fall, there were 535 applicants for 224 positions. A total of 222 (41%) physicians were matched to fill 99% of the positions. In June, 49 programs offered 78 positions in thoracic surgery. Of them, 90% were filled with 70 applicants (67%). Late in June, 45 vascular surgery programs offered 57 positions, of which 98% were filled with 56 (46%) of the applicants. The first hand surgery specialty Match will conclude May 17, 1989. Fifty-seven programs and 92 applicants have enrolled to date.

The Medical Specialties Matching Program (MSMP) took place last June for fellowships in all of the subspecialties of internal medicine for positions to begin in July 1989. The number of participating programs was 576 in 16 subspecialties that offered 1,351 positions. Eighty-six percent of these positions were filled by 1,162 applicants, who represented 65.2% of the active applicants; 34.8% of the applicants failed to match.

The Rank Order List Input and Confirmation System (ROLIC), in which the medical schools and teaching hospitals entered and confirmed their Rank Order Lists at some 500 sites, was used again this year. Access to an entry site was not available for 1,025 applicants that sent NRMP paper Rank Order Lists.

Data that describe the trends in numbers of positions offered and filled by U.S. seniors and other applicants have been published during the past several years as part of a larger NRMP directory, but this year are in a separate document.[2]

John S. Graettinger, M.D.

Dr. Graettinger is executive vice president, National Resident Matching Program, and professor of medicine (emeritus), Rush Medical College, Chicago, Illinois.

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SHORT PAPERS

Characteristics of Medical Schools and Their Affiliated Institutions

MARTHA R. ANDERSON, Ph.D., ROBERT F. DEDRICK, Ph.D.,
ROLAND G. HISS, M.D., and MARILYN A. BOWBEER

Abstract—Survey data from a sample of 58 U.S. and six Canadian medical schools were used to describe the current network of medical schools and their affiliates. Results showed that each medical school in the study averaged over 11 affiliates. The largest percentages of affiliates reported were in the categories of "community" hospitals (that is, the nongovernmental, not-for-profit hospitals), Veterans Administration hospitals, and city hospitals. Characteristics of the medical schools, such as class size, ownership, year established, and the presence of a university hospital, were not related to either the number or the kind of affiliates. However, the sizes of the affiliated institutions were associated with the year the medical school was established, the presence of a university hospital, and the class size of the medical school. *Acad. Med.* 64 (1989):543-545.

Health care institutions that have medical school affiliations have become a significant part of the medical education system. They provide substantial amounts of undergraduate and graduate medical education and allow medical schools to offer a variety of clinical settings and diverse curricula. Although affiliated institutions play an important role in medical education, no recent studies have examined the overall picture of the affiliated institutions' network.[1] The purpose of this study was to describe the current state of that network, particularly because the increasingly competitive nature of health care delivery has the potential to alter what may already be complicated or delicate relationships between medical schools and their affiliated institutions.

Method

In 1984, the authors asked the deans of all 127 U.S. and 16 Canadian medical schools to indicate their interest in forming an informal group in order to share information and ideas about affiliations. Eighty-two U.S. and Canadian medical schools (57% of all the schools queried) became members at that time. Of those, 64 (78%) supplied information for this study by completing a self-administered questionnaire in 1985. Although the sample was self-selected, comparisons of selected characteristics (ownership of the medical school, geographic location by Association of American Medical Colleges—AAMC—region, the size of the entering class, and whether the school was established before or after 1960) of the sample with corresponding features of all U.S. and Canadian medical schools suggested that there were no systematic biases.

The survey instrument consisted of a series of closed-ended questions in which respondents were asked for information about the following:

1. Characteristics of the medical school: public or private ownership; established before or after 1960; existence of a university-owned hospital; geographic location by AAMC region; class size
2. Characteristics of the affiliated institution: bed size; ownership
3. Characteristics of the affiliated relationship: affiliation status (major, limited, graduate); level at which the affiliation was managed; existence of a formal affiliation agreement

Relationships among these characteristics were examined using both univariate and bivariate statistical analyses. Tests of significance were conducted at the .05 level.

Results

The results of the survey showed that the medical school-affiliate network was both large and diverse.

Characteristics of the School

The majority of the medical schools responding were public (67%), had been established in or before 1960 (64%), and had university-owned teaching hospitals (75%). The largest

---

Dr. Anderson is program coordinator at The Medical Research Institute, San Francisco, California; Dr. Dedrick is a research associate; Dr. Hiss is professor of postgraduate medicine, coordinator of affiliated hospitals, and chairman of the Department of Postgraduate Medicine and Health Professionals Education; and Ms. Bowbeer is a program associate; all but Dr. Anderson are at The University of Michigan Medical School, Ann Arbor.

Correspondence should be addressed to Ms. Bowbeer, Office of the Coordinator of Affiliated Hospitals, The University of Michigan Medical School, G1205 Towsley Center, Ann Arbor, MI 48109-0201. Reprints will not be available.

proportion of the sample was from midwestern and northeastern medical schools (30% and 27%, respectively), and the smallest was from Canada (9%). Entering class sizes of the 64 schools ranged from 48 to 280, with a mean of 135. Fifty-eight percent of the schools had class sizes of 100–199.

The 64 medical schools were affiliated with a total of 731 institutions. The average number of affiliates per medical school was 11.4, the median was 8, and the range was from 3 to 40. Although the average number of affiliations per medical school did not differ greatly across the levels of the medical school characteristics, examination of the data reveals some interesting findings. For example, one might expect that medical schools established after 1960 would be mainly community-based schools and would have a larger number of major affiliates than would the traditional medical schools established prior to 1960. However, both groups had a mean number of 6.0 major affiliates, regardless of year established.

Characteristics of the Affiliated Institution

Regarding bed size, the average number of beds of the 570 affiliates that provided inpatient care was 370 with a range of 24 to 1,358 beds. As shown in Table 1, three medical school characteristics were related to the sizes of affiliates: (1) schools established in 1960 or before were affiliated with larger institutions (mean number of beds = 433) than those established after 1960 (mean number of beds = 350); (2) schools with university-owned hospitals were associated with larger institutions (mean number of beds = 433) than those without (mean number of beds = 324); (3) class size of the medical school showed a positive relationship to the size of the affiliate, that is, smaller medical schools were affiliated with smaller institutions (mean number of beds = 338), while larger medical schools were affiliated with larger institutions (mean number of beds = 471).

Information about the ownership of the affiliated institution was available for 724 institutions. Community hospitals (that is, the not-for-profit hospitals that are not government-owned) made up the largest proportion (67%) of affiliates. Government-owned hospitals, consisting

Table 1

Average Number of 731 Institutions, of the Beds in These Institutions, and of These Institutions in Each of Three Affiliation-Status Groups, in Terms of the Characteristics of the 64 Medical Schools with Which They Were Affiliated, 1985[*]

	Affiliated Institutions' Characteristics				
			Status		
Medical School Characteristics[†]	No.	No. Beds	Major	Limited	Graduate
Ownership					
Public (*n* = 43)	12.0	406.4	5.8	3.8	2.4
Private (*n* = 21)	10.2	406.9	6.4	2.4	1.0
Year established					
Before or during 1960 (*n* = 41)	12.2	432.8	6.0	3.6	2.1
After 1960 (*n* = 23)	10.1	349.6	6.0	2.8	1.5
University-owned hospital(s)					
Present (*n* = 48)	11.0	432.7	5.5	3.0	2.0
Not present (*n* = 16)	12.7	324.1	7.5	4.4	1.5
AAMC region					
Midwest (*n* = 19)	13.1	404.3	6.7	5.7	1.2
Northeast (*n* = 17)	12.2	368.7	7.4	2.9	1.3
South (*n* = 13)	10.2	457.5	3.8	2.6	3.5
West (*n* = 9)	9.2	404.7	5.8	0.4	2.3
Canada (*n* = 6)	9.8	415.8	5.2	3.2	1.5
Class size					
Less than 100 (*n* = 18)	11.5	337.7	5.8	2.9	2.9
100–149 (*n* = 20)	11.2	369.3	5.6	3.6	2.0
150–199 (*n* = 17)	10.8	465.6	5.3	2.3	0.9
More than 199 (*n* = 9)	13.1	471.1	7.4	5.0	1.1

[*] The table presents the average number of five characteristics of the institutions that were affiliated with the medical schools, in terms of five characteristics of these schools. For example, 43 public medical schools were affiliated with an average of 12 institutions each, which had an average of 406.4 beds; of that 12 institutions, 5.8 were major affiliates, 3.8 were limited affiliates, and 2.4 were graduate affiliates.

[†] The authors sent questionnaires regarding affiliations to 82 U.S. and Canadian schools.

of city hospitals (9%), Veterans Administration (VA) hospitals (8%), and state- or province-owned hospitals (8%), constituted the second largest proportion of affiliates.

Characteristics of the Affiliated Relationship

Of the 707 institutions for which data were available, 54% were major affiliates, 30% were limited affiliates, and 17% were graduate affiliates. On the average, medical schools had six major affiliates, with a range of one to 35; three limited affiliates, with a range from none to 22; and two graduate affiliates, with a range from none to 23.

A relationship was found between the ownership of the affiliate and its affiliation status. Eighty-four percent of VA hospitals were major affiliates, and over half (55%) of nongovernmental, not-for-profit hospitals were major affiliates, as were 54% of city hospitals. Over half (54%) of state hospitals had limited affiliations, while 77% of for-profit hospitals were graduate affiliates of medical schools.

A relationship was found between the bed size of affiliates and their affiliation status. Graduate affiliations were often found in smaller institutions (mean number of beds = 286), limited affiliations in slightly larger ones (mean number of beds = 349), and major affiliates were reported to have the most beds (mean number of beds = 398).

Regarding affiliation management, in 1977, the authors of the Medical School-Clinical Affiliation Study[2] recognized the growing trend for affiliations to be managed by the medical school rather than by the individual department. Survey results confirmed that the management of affiliations is largely an institutional rather than a departmental concern. Among the 667 affiliated institutions for which there were data, 87% of affiliations were managed centrally by either the university or the medical school and only 13% were departmentally managed.

Formal affiliation agreements have come to be accepted as a matter of course. Ninety-five percent of affiliations (655 out of 693) were covered by a formal affiliation.

Discussion

Although this study confirms that the medical school-affiliated hospital network in 1985 was both large and diverse, it also shows that knowledge of medical school characteristics does little to enhance understanding of medical education networks. None of the characteristics of medical schools used in this study (size, region, ownership, presence of the university hospital, class size, or year established) was related to the number of affiliations.

The importance of the affiliate in medical education is likely to grow in the next decade. Graduate medical education has increasingly been conducted in institutions affiliated with medical schools.[3] In addition, major changes in health care delivery, and, therefore, in medical education, are occurring as providers and policymakers deal with increasing health care costs. Hospitals that cooperate in medical education programs compete with one another for patients. The affiliation created to serve medical educational needs is being joined by "network arrangements" that have a clinical, not educational, purpose. The degree to which traditional educational affiliations will interact with, complement, or compete with clinical networks remains to be seen.

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AAMC DATA REPORT

HIV/AIDS Education in U.S. Medical Schools

The prevalence of the human immunodeficiency virus (HIV) and the acquired immunodeficiency syndrome (AIDS) has created a need for physicians prepared to aid in preventing the epidemic's spread and to care for those already infected. In order to learn how medical schools were responding to this need, in the fall of 1988 the Association of American Medical Colleges (AAMC) asked the deans of U.S. medical schools to complete a survey on the integration of HIV/AIDS-related topics into the medical school curriculum. Respondents at 107 of the 127 accredited schools completed the form, for a response rate of 84 percent. Two schools' data were reported in a form that proved unusable in the summary analyses. The responses of the remaining 105 schools are summarized here.

The survey form identified 14 HIV/AIDS-related topics and requested information concerning (1) where each topic was covered (course/clerkship), (2) who was responsible for covering it (responsible department), (3) the number of hours of instruction devoted to it, and (4) the curriculum year in which it was covered. Table 1 lists the responses to the first three of these questions. The topics appear in decreasing order of the number of schools that affirmed that they were covered. For instance, all 105 schools reported that "characteristics of retroviruses" was covered; some schools named more than one course, and thus this topic was covered in a total of 180 courses. The second column of information in the table shows the courses most frequently mentioned as covering the topic, and the third column names the departments most frequently reported as responsible for the teaching. The fourth column is a frequency distribution of hours of instruction devoted to the topic, including the median and mode.

It is clear that microbiology and immunology courses assume a large responsibility for teaching students about HIV infection. In addition to covering the basic science of retroviruses, immunologic aspects of infection, and pathogenesis, these courses incorporate information about the epidemiology of infection and modes of transmission, diagnostic testing, and treatment approaches. Although virtually all schools affirmed coverage of basic science and clinical aspects of HIV infection, this was less true of coverage of infection control procedures (88%); behavioral issues related to homosexuality and drug abuse (83%); physicians' professional responsibilities (79%); and psychosocial and cultural aspects of AIDS (74%).

The survey also asked respondents to estimate the percentages of AIDS patients among those seen by students at sites of the medicine and pediatric clerkships. The following summary of these responses refers only to the clerkship site with the *highest* frequency of AIDS cases and probably reflects an upper boundary to estimates of medical student experience in the care of AIDS patients. Only 57 schools reported data regarding pediatrics clerkships, and 45 (79%) of these responded that pediatric AIDS cases accounted for less than 5% of the patient population; the median frequency was 1%. Eighty-five schools reported data on medicine clerkships, with 40 (47%) of these indicating that AIDS cases accounted for less than 5% of patients. Twelve schools reported 10% of patients, and another 12 schools reported even higher percentages; the median was 5%.

Additional analyses were conducted to determine whether medical schools located in the epicenters of the epidemic

Table 1

Coverage of HIV/AIDS-Related Topics in the Curricula at 105 U.S. Medical Schools, 1988*

Topic (No. of Schools/No. of Courses*)	Course or Clerkship (Frequency of Mention)	Responsible Department (Frequency of Mention)	Hours of Instruction		
Characteristics of retroviruses (105/180)	Microbiology/immunology (95)	Microbiology/immunology (88)	< 1	8	**median 2.0**
	Pathology (17)	Pathology (17)	1–2	59	**mode 1.0**
	Virology/retrovirus (11)	Medicine clerkship (12)	3–4	13	
			5–9	12	
			≥10	2	
			NI†	17	
Immunological aspects of HIV infection (104/197)	Microbiology/immunology (80)	Microbiology/immunology (70)	< 1	15	**median 1.5**
	Pathology (22)	Pathology (29)	1–2	63	**mode 1.0**
	Medicine clerkship (12)	Medicine (27)	3–4	10	
	Introduction to clinical medicine (8)		5–9	5	
			≥10	3	
			NI†	17	
Modes of transmission/preventing transmission (103/247)	Microbiology/immunology (54)	Microbiology/immunology (54)	< 1	20	**median 1.6**
	Introduction to clinical medicine (19)	Medicine (44)	1–2	47	**mode 1.0**
	Medicine clerkship (17)		3–4	21	
			5–9	7	
			≥10	5	
			NI†	20	

Table 1 continued

Coverage of HIV/AIDS-Related Topics in the Curricula at 105 U.S. Medical Schools, 1988*

Topic (No. of Schools/No. of Courses*)	Course or Clerkship (Frequency of Mention)	Responsible Department (Frequency of Mention)	Hours of Instruction		
Treatment approaches to AIDS and simultaneously occurring infections (97/203)	Medicine clerkship (35) Microbiology/immunology (31) Pharmacology (24) Introduction to clinical medicine (14)	Medicine (51) Microbiology/immunology (31) Pharmacology (24)	< 1 1–2 3–4 5–9 ≥10 NI†	9 54 16 4 4 30	median 2.0 mode 1.0
Other pertinent ethical issues (e.g., confidentiality, informed consent, duty to warn) (94/181)	Ethics (32) Medicine clerkship (15) Introduction to clinical medicine (11)	Medicine (29) Psychiatry (14) Family medicine (13)	< 1 1–2 3–4 5–9 ≥10 NI†	11 47 8 12 10 37	median 2.0 mode 1.0
Infection-control procedures for healthcare workers (92/205)	Other clerkships (29) Microbiology/immunology (26) Medicine clerkship (21) Introduction to clinical medicine (20) Infectious diseases (6)	Medicine (39) Microbiology/immunology (26) Infectious disease/infection control (9)	< 1 1–2 3–4 5–9 ≥10 NI†	21 42 13 5 6 22	median 1.0 mode 1.0
Behavioral issues related to homosexuality and intravenous drug abuse (87/157)	Behavioral science (23) Psychiatry clerkship (19) Introduction to psychiatry (16)	Psychiatry (57) Family medicine (9) Community health (5)	<1 1–2 3–4 5–9 ≥10 NI†	9 36 12 10 8 6	median 2.0 mode 1.0
Epidemiology of HIV infection (102/234)	Microbiology/immunology (62) Epidemiology/community health (34) Pathology (20) Introduction to clinical medicine (16)	Microbiology/immunology (60) Medicine (33) Public health (28) Pathology (18)	< 1 1–2 3–4 5–9 ≥10 NI†	15 44 24 8 5 16	median 2.0 mode 1.0
Pathogenesis of disease (102/227)	Pathology (56) Microbiology/immunology (53)	Pathology (50) Microbiology/immunology (45)	< 1 1–2 3–4 5–9 ≥10 NI†	12 49 20 9 3 15	median 2.0 mode 1.0
Diagnosis, including serologic testing procedures (100/232)	Microbiology/immunology (64) Pathology (30) Introduction to clinical medicine (19) Medicine clerkship (17) Other clerkship (15)	Microbiology/immunology (59) Pathology (34) Medicine (34)	< 1 1–2 3–4 5–9 ≥10 NI†	10 51 13 12 5 23	median 1.5 mode 1.0
Taking a sexual history (99/172)	Introduction to clinical medicine (33) Physical diagnosis (16) Human sexuality (16) Obstetrics/gynecology clerkship (15)	Psychiatry (39) Medicine (33) Obstetrics/gynecology clerkship (19)	< 1 1–2 3–4 5–9 ≥10 NI†	13 47 25 4 1 30	median 2.0 mode 2.0
Professional responsibility of physicians to care for HIV-infected persons (83/158)	Ethics (24) All other clerkships (18) Medicine clerkship (14) Introduction to clinical medicine (10)	Medicine (28) Family medicine/community practice (17) Psychiatry (12)	< 1 1–2 3–4 5–9 ≥10 NI†	13 37 11 12 1 35	median 1.5 mode 1.0

continued

Table 1 continued

Coverage of HIV/AIDS-Related Topics in the Curricula at 105 U.S. Medical Schools, 1988*

Topic (No. of Schools/No. of Courses*)	Course or Clerkship (Frequency of Mention)	Responsible Department (Frequency of Mention)	Hours of Instruction		
AIDS in the pediatric age group (81/120)	Pediatrics clerkship (59) Microbiology/immunology (10)	Pediatrics (67) Microbiology/immunology (6)	< 1	10	median 1.1
			1–2	44	mode 1.0
			3–4	7	
			5–9	2	
			≥10	0	
			NI†	26	
Other psychosocial and cultural aspects of AIDS (78/142)	Behavioral science (17) Psychiatry clerkship (15) Introduction to clinical medicine (7)	Psychiatry (39) Medicine (17)	< 1	9	median 1.5
			1–2	45	mode 1.0
			3–4	8	
			5–9	6	
			≥10	7	
			NI†	22	

*Most schools reported that the topic was covered in more than one course; hence the number of courses indicated in all cases is greater than the number of schools.

†NI = no information.

tended to provide more hours of instruction in HIV/AIDS than did other schools. Twenty-five medical schools were identified as located in the ten standard metropolitan statistical areas (SMSA) with the highest numbers of recorded AIDS cases, as reported by the Centers for Disease Control.[1] A comparison of these schools with the other 80 medical schools revealed that, for 11 of the 14 topics, the schools located in the epicenters reported on average more instructional time, particularly on the following topics: infection control procedures (3.9 vs. 2.2 hours), modes of transmission (3.2 vs. 2.4), pathogenesis (3.4 vs. 2.3), treatment approaches (3.5 vs. 2.3), behavioral issues related to homosexuality and intravenous drug abuse (4.7 vs. 3.3), and ethical issues related to HIV/AIDS (4.8 vs. 3.9).

Due to the nature of the epidemic, medical students' experience in caring for patients with AIDS varies widely across the country. However, the processes of integrating HIV/AIDS-related topics in the medical school curriculum appears to be well under way at all medical schools responding to the survey. While responsibility for addressing HIV/AIDS in the curriculum also varies from school to school, the following departments were most frequently involved: microbiology/immunology, pathology, medicine, and psychiatry. As the HIV epidemic unfolds, the need for AIDS-related instruction will increase, particularly with regard to the basic attitudes and skills described in the report, *The HIV Epidemic and Medical Education*, by the AAMC Committee on AIDS and the Academic Medical Center.[2]

Janet Bickel, M.A.
Robert F. Jones, Ph.D.
Laura Biesiadecki

Ms. Bickel is senior staff associate, Dr. Jones is director for institutional planning, and Ms. Biesiadecki is research assistant, Division of Institutional Planning and Development, Association of American Medical Colleges, Washington, D.C.

To receive an expanded report of the survey results, contact Janet Bickel at 202/828-0575.

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INVITED ARTICLE

ALLEN SINGER, Ph.D.

The Effect of the Vietnam War on Numbers of Medical School Applicants

Abstract—Among the little-noticed but far-reaching side effects of the Vietnam War was its impact on the higher education system. This often-unpopular war, coupled with the military draft and student deferment policies, led many young men to enter educational institutions of all types. Beginning around 1964, there was a surge of enrollments and degrees granted in higher education that began to abate only after the draft ended in 1973. The leading edge of the post-World War II "baby-boom" also became of college age in the mid-1960s and undoubtedly contributed to elevated levels of enrollments and degrees in higher education. But the Vietnam War had an impact over and above the purely demographic, as can be seen when population effects are factored out. This effect largely explains why the numbers of bachelor's degrees and doctorates (Ph.D. degrees and equivalent) granted to men suddenly stopped increasing in 1974 even though the relevant population groups continued to grow throughout the 1970s. The patterns of enrollments and degrees attained by women are quite different from the men's patterns, and they serve to reinforce the evidence of a draft effect. Students in health professions schools of all types were given special consideration under the deferment policies established by the Selective Service System, leading to rapid increases in applications to medical, dental, and other health professions schools during the period 1968–1974. Since then, the health professions schools have had quite similar experiences with applications—those from men have generally declined while those from women have generally increased. Also, career choices are shifting. Men are favoring degrees in business, engineering, and computer sciences over the main fields leading to medical schools—biology and chemistry. Women now outnumber men in number of bachelor's degrees granted annually, and the number of those degrees in the science fields is holding steady. *Acad. Med.* 64(1989):567–573.

Among the main concerns of the medical community today are the declining number of medical school applicants since 1974 and the implications of this trend for the long-term quality of medical education. This concern has prompted an examination of the causes of the rapid increase in medical school applicants starting around 1968 and the equally rapid and prolonged decrease from the 1974 peak.

It is tempting to attribute much of the increase to population growth because the post-World War II "baby-boom" generation began to pass through college in the 1960s. But population growth does not explain the sudden cessation in 1974 of growth in male college enrollments and degrees attained, because the college-aged population segments continued to increase until the 1980s. Instead, the evidence suggests strongly that student deferment policies established during the Vietnam War era led to a huge bulge at all levels of the higher education system. The historical data compiled for this analysis demonstrate the following points:

1. Much of the decline in applicants to medical school since 1974 has been a return to normality after an era of exceptionally strong growth in applicants that began around 1968 as a result of deferment policies that permitted undergraduate and graduate students to avoid or delay the military draft.

2. The effects of the Vietnam-War-era draft and deferment policies on applicants should have worked its way through the system and ended around 1978. The fact that the decline has continued through 1988 may be attributable to a combination of factors, including: (a) a radical shift away from the main fields leading to medical schools—biology and chemistry—in favor of engineering, computer sciences, and business, especially among men students; (b) sharp increases in medical school tuition beginning around 1976; and (c) the increasingly heavy debt burden incurred by college students during their undergraduate years.

3. The decline in medical school applicants is not an isolated phenomenon. Dental, veterinary, osteopathic, and other professional schools have had similar experiences traceable to an enrollment bulge in the educational system that started with increases in freshman enrollments around 1964 and led to more bachelor's and doctoral (Ph.D. and equiva-

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Dr. Singer is senior research associate, Section for Operational Studies, Association of American Medical Colleges, Washington, D.C.

Correspondence and requests for reprints should be addressed to Dr. Singer, Section for Operational Studies, Association of American Medical Colleges, One Dupont Circle, N.W., Suite 200, Washington, D.C. 20036.

lent) degrees and more professional school applicants during the late 1960s and early 1970s. Student deferments encouraged high school graduates to enroll in college and permitted those already in undergraduate and graduate studies to complete their degree programs. Further, students in health professions schools were given special consideration under Selective Service policies.

The evidence for these assertions is presented in the following review and analysis of demographic and educational data covering the period from the mid-1950s to the mid-1980s and their relationship to the military draft and student deferment policies that prevailed during the Vietnam War. The figures accompanying this paper show the historical data on enrollments, degrees, applicants, and populations in corresponding age groups.

Method

Time series analyses provide the basic evidence leading to these findings.

Demographic and Educational Data

Before 1960 much of the necessary data does not exist in consistent form, and even to get data as far back as 1955 in some cases requires making assumptions and estimates. Nevertheless, the effects of the Vietnam War era draft on the educational system are so pronounced that they overcome any deficiencies in the data.

There are many possible explanations of the patterns exhibited by the data other than the draft—one of the major ones being demographic effects. Certainly the post-World War II "baby-boom" affected undergraduate and graduate school attendance in the 1960s and 1970s. But the data show that the draft and deferment policies created an effect that extended well beyond the purely demographic one.

In order to include the demographic factor in the analysis, ratios of each variable to the appropriate population group were calculated and are shown in the figures. For example, the number of first-time college enrollments has been related to the total population aged 18; bachelor's degrees have been related to the population aged 20 to 24; and professional school applicants have been related to the population aged 20 to 29.

In the figures, growth curves of the form $Y = e^{a-b/t}$ (shown as broken lines) have been fitted to the data in order to help estimate the magnitude of the Vietnam War effect. The curves are rough approximations of the patterns that would have occurred in the absence of the draft. In deriving the curves, the years in which the draft effect was most apparent were excluded. The assumption here is that the data would have followed a constrained growth pattern except for the distortions caused by the Vietnam War. This procedure is admittedly subjective, and the estimated growth curves should be interpreted as projections based on limited data sets.

Male-Female Comparisons

It is rare in studies of this kind to have adequate comparisons groups, but fortunately for this analysis a natural comparison group does exist. Since only men were subject to the draft, the patterns exhibited by women over this period should be different, and indeed they are. But women also seemed to react to the draft to a certain extent. Their patterns of enrollments and degrees during the draft era mirrored those of men, but to a lesser degree. One possible explanation is that women were induced for social and perhaps economic reasons to follow their men friends to college.

After the draft era ended, however, the men's and women's patterns departed radically from each other, with women's participation in undergraduate studies generally continuing to increase while that of men began to decline. By 1982 the number of bachelor's degrees granted to women exceeded the number granted to men, apparently for the first time in U.S. history.

Findings and Discussion

The findings show clearly the effect of the Vietnam War military draft on higher education enrollments and degree patterns.

Draft and Deferment Policies

A basic hypothesis of this paper is that the military draft and deferment policies in effect during the Vietnam War era created an enrollment bulge at all levels of the higher education system, starting in the mid-1960s and lasting for about ten years. The decline in applications to medical and other health professions schools during the late 1970s was largely due to the elimination of the draft in 1973, the end of the Vietnam War, and the subsequent return to a more normal pattern of college attendance on the part of young men. (The continued decline in applicants in the 1980s has a more complicated explanation, see page 572.)

The Selective Service System has undergone changes in its deferment policies many times since World War II as the needs of the military waxed or waned in response to international threats or conflicts. During the Korean War, draft calls accelerated from zero in 1950 to over 550,000 in 1951.[1] At that time, high school students were automatically deferred until graduation or age 20, and college students were deferred on the basis of the Selective Service College Qualification Test (SSCQT), class standing, or other evidence of satisfactory academic progress. The Korean War must have had an effect on the educational system similar to that of the Vietnam War, but an examination of that earlier period is beyond the scope of this paper.

After the Korean conflict ended, the draft remained in effect but at much reduced levels. Then, as the Vietnam conflict heated up in the 1960s, the Defense Department began to call for more inductions, and the number of educational deferments rose to new heights, remaining there until the draft was replaced by the all-volunteer army in 1973 (Figure 1).

Deferments for students were established in the Selective Service System under a concept called "channeling" whereby men in certain occupations deemed vital to the nation were granted exemptions from the draft. In 1951, categories I-S and II-S were established for deferred high school and college students, respectively. Liberal deferment policies for students were generally in effect until the Vietnam War escalated in the mid-1960s. In 1962, the SSCQT was dropped as a requirement for student deferments; students needed only to show evidence of satisfactory academic progress to retain their deferred status. A surplus of men eligible for the draft existed through 1964.

Then in 1965, the monthly draft requirements doubled because additional troops were needed in Vietnam. Previous manpower surpluses suddenly turned into shortages, and student deferment policies were tightened. The SSCQT was reinstated as a requirement for educational deferments in the spring of 1966, and the number of inductions tripled.

Further tightening continued in 1967. Additional constraints were placed on undergraduate and graduate students, but students in medical, dental, veterinary, osteopathy, and optometry schools were deferred upon evidence of satisfactory progress. In 1968, postgraduate deferments were extended *only* to students in the health professions schools, although graduate students were usually allowed to finish an uncompleted semester if drafted during the school year.

President Richard Nixon eliminated class II-S (college) deferments in 1971. Students in the II-S category during the academic year 1970–71 were permitted to remain in II-S so long as they qualified, but no new student deferments were granted. However, by 1971 the number of inductions was diminishing, and it was clear that the draft would soon end. The number of calls for induction in 1972 and early 1973 were minimal, and the draft was replaced by the all-volunteer army in 1973.

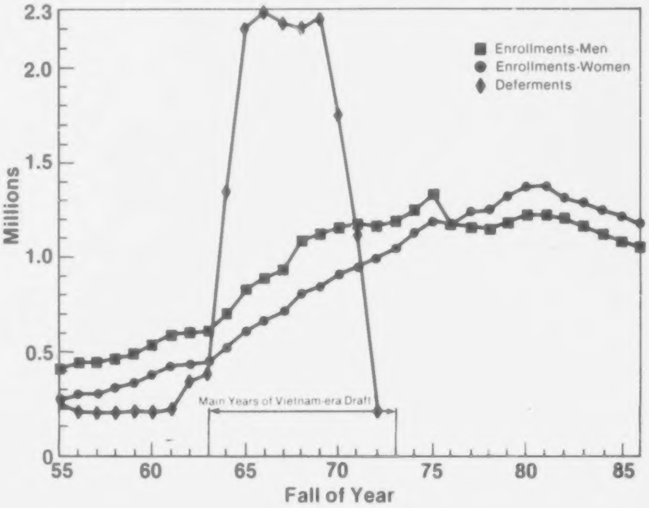

Figure 1. **Number of military draft deferments, 1955–1972, and number of first-time college enrollments for men and women, 1955–1986. (Source: Director of Selective Service; U.S. Bureau of the Census; and U.S. Department of Education)**

The effects of these events on college enrollments, degrees granted, and medical school applicants are examined in the following sections.

First-Time College Enrollments

From 1955 to 1963, the number of students enrolling in college for the first time showed steady growth of almost 5% per year for men and over 7% for women (Figure 1). For men this represented a steady-state growth about equal to the growth in the civilian population aged 18. For women during this period, college attendance increased at more than twice the rate of the growth of the civilian population aged 18.

During the Vietnam War era—roughly 1963 to 1972—the enrollments of both men and women freshmen showed accelerated growth. As can be seen in Figure 2, for men this represented a sharp increase relative to the civilian population aged 18, compared with the trend that had prevailed until 1963. After the draft effect had played itself out around 1976, women's freshman enrollment continued to increase through 1985 relative to the civilian population aged 18, while the men's ratio dropped to a lower, apparently steady-state level.

Bachelor's and Doctoral Degrees Granted

If college entrance rates were elevated as a result of the draft and deferment policies during the Vietnam War era, we should expect to see corresponding increases in bachelor's, master's, and doctorate (Ph.D. and equivalent) degrees awarded after a delay of several years. Figure 3 shows that the number of bachelor's degrees granted during the late 1960s and early 1970s did indeed take an upward swing. For men the upswing appears to have started around 1967 and peaked in 1974. The average growth rate during this period was 7.3% per year, considerably higher than the 5% annual growth rate that prevailed in the preceding ten years.

For women the growth rate in bachelor's degrees from 1967 to 1974 at 8.5% per year was even faster than that for men during this period but

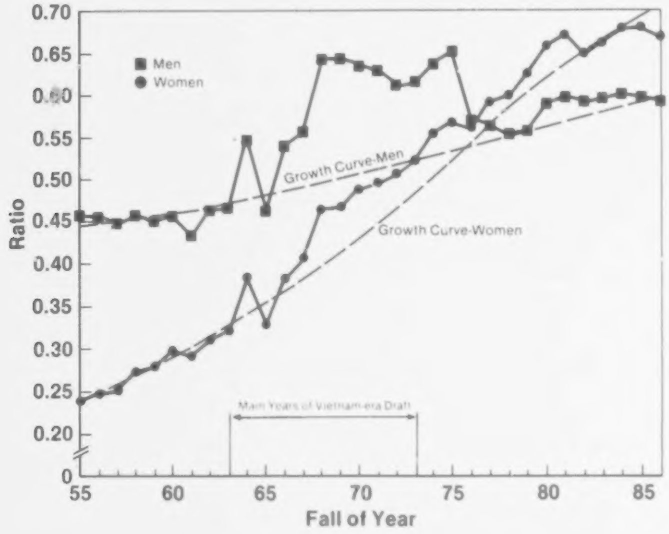

Figure 2. **Ratio of first-time college enrollments to the civilian population aged 18, 1955–1986. Growth curves were derived from data for 1955–1963 and 1977–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education and U.S. Bureau of the Census)**

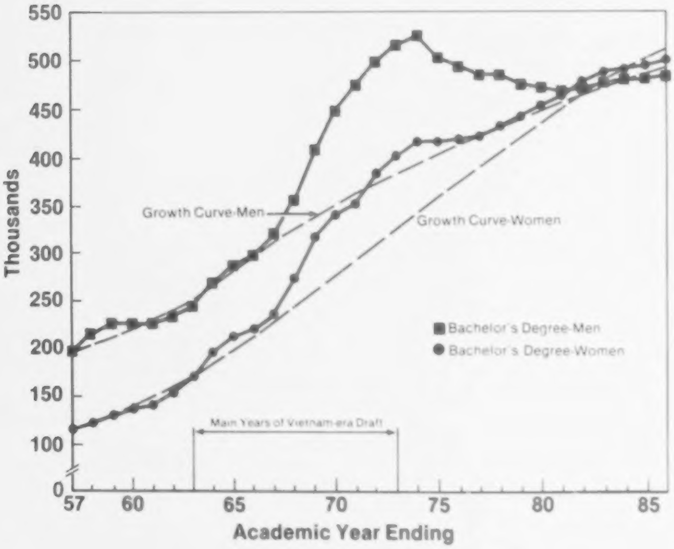

Figure 3. **Number of bachelor's degrees granted 1957–1986. Growth curves were derived from data for 1957–1967 and 1981–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education)**

only slightly higher than the growth rate for women during the preceding decade, which was 7.3% per year. This is evidence that a strong movement for greater educational attainment by women had already begun before the Vietnam War era. The movement continued through the draft years at an accelerated pace until the mid-1970s, and then at a somewhat slower pace into the 1980s.

It should be noted that more than demographic effects are involved. We are witnessing some long-term changes in the traditional career choice patterns of men and women in the United States. Figure 4 shows clearly that in the past 30 years, the huge gap between men and women in numbers of bachelor's degrees attained relative to the population aged 20–24 has been completely closed.

Figure 4 also demonstrates most clearly the effect of the Vietnam War draft on men's attainment of bachelor's degrees, even after population effects have been factored out. The bulge in the ratio of men's degrees to the population aged 20–24 is much more pronounced than that for women for the period covering 1966 to 1976.

An equally pronounced effect of the draft on men's attainment of doctorates is shown in Figure 5. Since more than 90% of all Ph.D. recipients are between the ages of 25 and 44,[8] this group was used as the population base. The number of men who received doctorates relative to the civilian population in this age group began to accelerate rapidly in the early 1960s. It reached a peak of almost 1.2 doctorates per 1,000 men aged 25–44 in 1971 and has declined continuously since then.

In terms of women's doctorates, the Vietnam-War-era effect appeared later and was much smaller than that for men. The number of women receiving doctorates relative to the population aged 25–44 seems to have had a slight bulge over the expected growth rate during the period 1970 to 1983. Although the acceleration was not as rapid as that for men, the number of women's doctorates relative to the population aged 25–44 has remained high.

Professional School Applicants

Health professions schools of all types were the ultimate beneficiaries of the effect shown by the enrollment and degree patterns discussed above. The pattern of applicants to medical schools is shown in Figure 6.[9,10] Data on applicants to other health professions schools (shown in Figure 7) are not as well tabulated, but they also show declining trends for men and generally increasing trends for women in the late 1970s and 1980s.

From 1967 to the peak in 1974, the number of men applying to medical school increased at a rather startling rate of over 10% per year. Increases for dental school applicants were not far behind at 9% per year from 1967 to the peak year in 1975.[11-13] Since those peaks, the numbers of men applying to both medical and dental schools have declined steadily through 1986.

In osteopathic schools, the number of men applicants dropped 31% between 1977 and 1987 (from 3,359 to 2,316), while the number of women applicants increased by 79% (from 559 to 1,002) over that period.[14]

In veterinary colleges, the total number of applications has declined since 1976. The only available data on the genders of applicants show that the numbers of men and women applicants have both declined since 1981[15]; however, the rate of decline was much steeper for men than for women. Actually, the number of women applying to veterinary schools surpassed the number of men in 1983; by 1988, the ratio was 2,511 women applicants to 1,689 men applicants.

In law schools, the pattern was similar but less pronounced. The number of men applying declined by less than 9% between 1977 and 1986, and the number of women applying increased by 39% over that period.[16] Unfortunately, no data are available on law school applicants before 1977, so we can only speculate that the Vietnam War draft had some impact, but less than that on the health professions schools.

In most cases, the Vietnam War effect seems to have ended by the late 1970s. Figure 6 shows that if the pre-

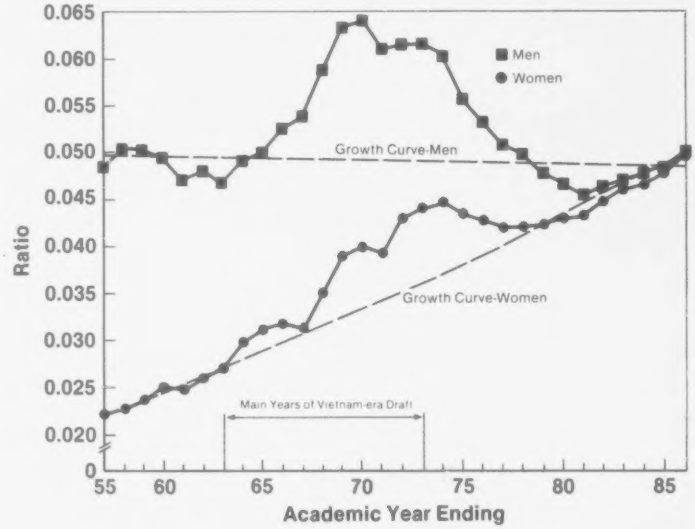

Figure 4. **Ratio of awarded bachelor's degrees to the civilian population (in thousands) aged 20–24 for the years 1957–1986. Growth curves were derived from data for 1957–1967 and 1981–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education and U.S. Bureau of the Census)**

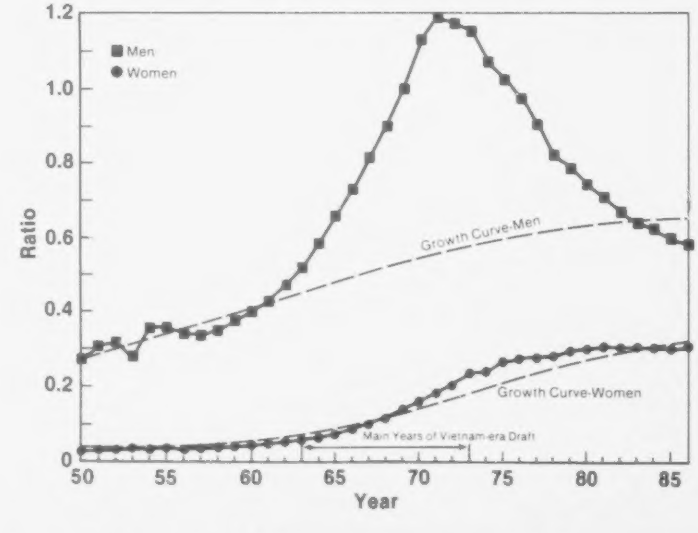

Figure 5. **Ratio of awarded doctoral degrees to the civilian population (in thousands) aged 25–44 for the years 1950–1986. The growth curve for men was derived from data for 1950–1962 and 1980–1986; the curve for women was from data for 1950–1986. These curves estimate the patterns that would have occurred in the absence of the Vietnam War effect. (Source: Harmon and Soldz, *Doctorate Production in U.S. Universities 1920–1962*; and U.S. Bureau of the Census)**

Vietnam War trends had continued, the application rates of men would have returned to their long-term trend lines by approximately 1977. Why did they continue to fall while those of women stabilized? One answer is that men in large numbers avoided the main academic disciplines leading to the health professions schools — biology and chemistry — in favor of engineering, computer science, and business. The number of bachelor's degrees in biology granted to men reached a peak of 35,520 in 1976 and dropped to 19,993 by 1986; in chemistry, the number dropped from 8,659 to 6,483 during the same period. For women the pattern was different. The number of bachelor's degrees in biology granted to women reached a peak of 19,797 in 1978 and dropped just slightly to 18,531 by 1986; in chemistry the number actually increased steadily after 1950, reaching a peak of 3,791 in 1985.

These patterns help to explain the trends in numbers of applicants to medical and dental schools in the 1980s, but the deeper reasons for the flight of men from the biological and chemical sciences remains to be explained, as does the impact of tuition increases and debt on decisions to apply to medical school.

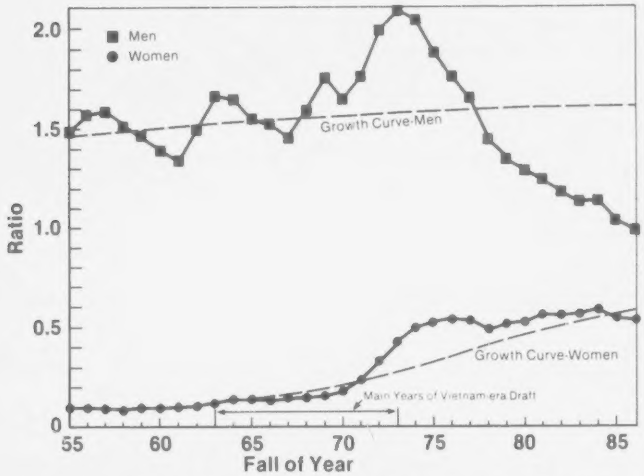

Figure 6. **Ratio of medical school applicants to civilian population (in thousands) aged 20–29 for the years 1955–1986. The growth curve for men was derived from data for 1955–1971 and 1978–1986; the curve for women was from data for 1950–1986. These curves estimate the patterns that would have occurred in the absence of the Vietnam War effect. (Source: Association of American Medical Colleges, *Data Book*; Johnson, *U.S. Medical Students 1950–2000: A Companion Factbook for "Physicians in the Making"*; and U.S. Bureau of the Census)**

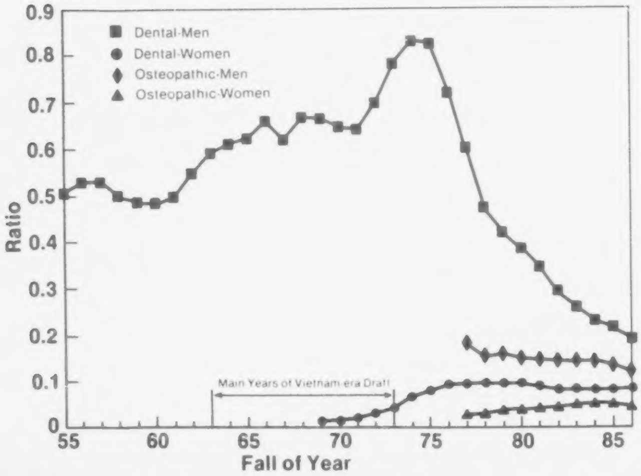

Figure 7. **Ratio of dental and osteopathic school applicants to civilian population (in thousands) aged 20–29 for the years 1955–1986. Data not available for all years. (Source: American Association of Dental Schools: American Dental Association; and American Association of Colleges of Osteopathic Medicine)**

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RESEARCH REPORTS

ARTICLES

Likelihood of Contact with AIDS Patients as a Factor in Medical Students' Residency Selections

ROBERTA NESS, M.D., M.P.H., CHARLES D. KILLIAN, M.A.,
DAVID E. NESS, M.D., JUDITH B. FROST, M.A., and DON McMAHON, M.A.

Abstract—Results from the National Resident Matching Program for the years 1980, 1983, and 1987 were used to examine changes over time in the matches of U.S. medical students to residencies in cities with high concentrations of patients with acquired immunodeficiency syndrome (AIDS) and to specialties in which the care of AIDS patients was most concentrated. Medical students seeking postgraduate training in categorical surgery residency programs were less likely to be matched with programs located in areas where the numbers of reported AIDS cases were high in 1987 as compared with the "pre-AIDS" years of 1980 or 1983. This trend was more pronounced for students from medical schools located in cities with high numbers of AIDS cases. There was a decline in matches to residencies in categorical internal medicine nationally, regardless of location; this decline was also greater among the students coming from medical schools in cities with high numbers of AIDS cases. The authors discuss the implications for medical educators of declines in matches to specialties in which the care of AIDS patients is most concentrated. The imperfect nature of available measures of students' exposure to AIDS patients makes the data of this study preliminary, and further studies are being undertaken. However, the finding of significant effects in spite of the imprecision of some measures suggests that future work will confirm the results of this study. *Acad. Med.* 64(1989):588–594.

During the 1980s there has been a dramatic yearly rise in the number of reported cases of acquired immunodeficiency syndrome (AIDS). Concurrently, some medical professionals have expressed concern and anxiety about taking care of patients who have AIDS[1,2] for such reasons as fear of contagion, homophobia, reluctance to take on a burdensome workload, and the knowledge that almost all AIDS patients die.[3–8] In some cases, physicians have refused to care for individuals with AIDS,[9,10] a behavior that has generated ethical debate within the medical community.[11–14] These attitudes and behaviors have also created concern that prospective physicians may attempt to avoid contact with AIDS patients in their careers by removing themselves from geographic areas or specialty training in which these patients may be concentrated.

Anecdotal reports suggest[15–17] that at least some medical students feel negatively toward AIDS patients and have refused to perform certain care-giving duties for them. However, we are aware of only two published studies about the potential impact of AIDS on the career decisions of medical students. In a New York City survey,[18] over 40% of the students felt that the presence of large numbers of AIDS patients would "reduce the scope and value of training offered" in a residency training program. Another survey,[19] in a Washington, D.C. medical school, disclosed that 27% of the students surveyed had considered changing their careers because they would be required to work with AIDS patients. It is not clear how widespread these attitudes are among students or to what extent they actually influence career choices.

We designed our study to explore the possible impact of AIDS upon medical students' choices of residency positions, as assessed by the results of students' selections in the National Resident Matching Program (NRMP). We tested two hypotheses. The first was that during the AIDS epidemic, students would be less attracted than they had been in previous years to the primary care specialties that provide the most care to AIDS patients, such as internal medicine; to higher-risk invasive specialties such as surgery; and to programs located in hospitals with high case-

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Dr. Roberta Ness is research fellow, School of Public Health, and Dr. McMahon is director, Clinical Research Information Systems, Columbia University, New York, New York; Mr. Killian is senior research associate and director, Student and Applicant Information Management System, and Ms. Frost is research associate, Association of American Medical Colleges; and Dr. David Ness is assistant professor, the University of Pennsylvania School of Medicine, Department of Psychiatry, Philadelphia, Pennsylvania.

Correspondence and requests for reprints should be addressed to Mr. Killian, Association of American Medical Colleges, Suite 200, One Dupont Circle, NW, Washington, DC 20036.

loads of AIDS patients. The second hypothesis was that greater likelihood of contact with AIDS patients during medical school would be inversely associated with students' being matched to a residency program in which AIDS patients were common.

Method

The following section presents the data sources, variables, and analyses employed in this study.

Data Sources and Subjects

We employed data from two sources: the NRMP and the Association of American Medical Colleges' (AAMC) Student and Applicant Information Management System (SAIMS). We used the NRMP's complete databases of candidates matched for the years 1980, 1983, and 1987; these comprise data on schools of origin, hospital programs to which students were matched, and types of specialty programs that were selected by all students who were matched successfully during those years. Included were about 85% of all U.S. medical school graduates.[20-22] Only residency matches for the first year of postgraduate training were considered. The use of NRMP match results rather than students' actual choice lists was necessary because the NRMP keeps the choice list strictly confidential. We deemed the match results to be a valid indicator of preference because 57% of the students were matched to their first choice of residency and 83% were matched to one of their first three choices[23]; furthermore, students are aware that they are not guaranteed their first or even their second match choices, so that any choice within the top three must be acceptable to the student as a training program.

The SAIMS includes among its data elements students' sociodemographic data, academic history, questionnaire responses, and the results of the NRMP-AAMC joint tracking of residents. Of particular importance for this study were the responses of approximately two-thirds of all graduating seniors to the annual Graduation Questionnaire. These data were used to control for the effect of student sociodemographic characteristics by using items from the SAIMS database, including age, sex, ethnicity, marital status, number of dependents, total debt, MCAT scores, research interest, rural background, and desired practice setting. The effect of geographic proximity between medical school and residency sites was controlled by a propinquity indicator that was defined as "1" for students matching to the same region as that of their medical school and "0" for others. The United States was classified into nine geographic regions based on the American Medical Association's (AMA) definitions of these regions.[24]

Definition of Variables

Matches in the pre-AIDS years 1980 and 1983 were compared with matches in the post-AIDS year 1987. We chose 1980 for two reasons: it represents the first year that match results were computerized by the NRMP, and it was the year preceding the first reports of AIDS as a disease entity.[25,26] We chose 1983 because it was the first year that data from the joint NRMP-AAMC residency tracking project were available, and so it was the first year in which we could control for student demographic factors in our multivariate analyses. There are no data to suggest, and there is little reason to believe, that at the outset of 1983 AIDS was a factor in medical students' residency choices. In that year the outbreak was limited to a cumulative total of 878 reported cases nationally,[27] there had been no reports of transmission to hospital personnel (indeed AIDS had not been shown to be caused by an infectious agent), and the case mortality rate was estimated at just over 50%. Thus, the reasons for the concerns voiced later — contagion, burdensome workload, and the high fatality rates of AIDS patients — would have been unknown in early 1983. In contrast, by the beginning of 1987 more than 28,000 cases of AIDS had been reported,[28] and concerns among the medical profession toward caring for these patients had been broadly publicized.

We compared changes between the pre-AIDS years of 1980 and 1983 and the post-AIDS year of 1987 in U.S. graduates' match rates to residencies in areas of the country where medical students would be more likely to be exposed to large numbers of AIDS patients and also to residencies in areas where exposure would be less likely. Because AIDS case counts are not available for all individual medical schools and residencies, we classified institutions as being in areas with high or low frequencies of reported AIDS cases by using the 1986 year-end new case counts for each Standard Metropolitan Statistical Area (SMSA) provided by the Centers for Disease Control (CDC).[28] (See Table 1.) These numbers were used as estimates of cumulative incidences of AIDS in the clinical populations to which the students who were matched in 1987 would have been exposed.

Given the imprecision of current measures of students' exposure to AIDS, the observed effects are probably underestimated in the present study. We anticipate that the use at the institutional level, of more refined measures, of AIDS exposure will demonstrate stronger trends. We are now conducting a study in which we use AIDS case counts by institution to define students' exposures.

For the purposes of the present study, for all three of the years studied, each medical school and residency in the match was assigned the 1986 year-end number of AIDS cases in its SMSA. Thus, institutions in areas with high numbers of AIDS cases in 1987 were assigned the same high numbers of such cases for 1980 and 1983, so that the behavior of students in a given location in a post-AIDS year could be compared with the behavior of students in the same location in pre-AIDS years.

In stratified bivariate analyses a dichotomous measure of AIDS cumulative incidence was used. The 20 cities with the greatest numbers of new cases of AIDS per year were compared with all other cities. An interval measure was used in the regression models whereby actual case counts

Table 1

Numbers of Cases of AIDS in 20 Standard Metropolitan Statistical Areas (SMSAs) and the Populations of These Areas, 1986*

SMSA of AIDS Cases	No. AIDS Cases	Population (in millions)
New York, N.Y.	3,423	9.12
San Francisco, Cal.	1,347	3.25
Los Angeles, Cal.	1,294	7.48
Houston, Tex.	567	2.91
Washington, D.C.	436	3.06
Miami, Fla.	394	1.63
Chicago, Ill.	379	7.10
Newark, N.J.	340	1.97
Dallas, Tex.	332	2.97
Philadelphia, Pa.	304	4.72
Atlanta, Ga.	261	2.03
San Diego, Cal.	212	1.86
Boston, Mass.	211	2.76
Ft Lauderdale, Fla.	203	1.02
Nassau-Suffolk, N.Y.	183	2.61
Jersey City, N.J.	168	0.56
Seattle, Wash.	174	1.61
New Orleans, La.	144	1.19
Baltimore, Md.	131	2.17
Denver, Colo.	129	1.62
Total for SMSAs	10,632	61.63
Total for the rest of the U.S.	4,382	168.48
Combined total	15,014	230.11

*The table shows all known cases in 1986 by date of diagnosis rather than date of report. The data are for the 20 SMSAs with the highest case counts as compiled by the Centers for Disease Control.

per city were applied to the 20 cities with the highest AIDS frequencies "high-AIDS locations" as compared with all other cities. (See Table 1.) This allowed a more precise ranking of cities by numbers of cases.

Specialties were defined on the basis of the NRMP codes for the appropriate year.[29,30] The surgical subspecialties included for this analysis were neurosurgery, plastic surgery, otolaryngology, ophthalmology, and orthopedic surgery. The radiology/nuclear medicine subspecialties included were diagnostic radiology, therapeutic radiology, and nuclear medicine.

Analysis

We first compared the proportions of the students in the pre-AIDS years and post-AIDS year who chose each specialty. The proportion of the students choosing a given specialty in the post-AIDS year was divided by the proportion choosing that specialty in a pre-AIDS year in order to determine the relative proportions being matched to that specialty; in an epidemiologic context, these measures are equivalent to relative risks. In a similar manner we determined the relative proportions being matched to a high-AIDS location in the pre-AIDS years as compared with the post-AIDS year. Because the choice of specialty and the choice of location are interdependent, we also determined the relative proportion of students matching to a high-AIDS hospital in each specialty over time. The sample was then stratified into students from high- and low-AIDS medical schools (that is, medical schools in SMSAs in which the numbers of AIDS cases were relatively greater or less) and relative proportions were compared between these strata. A chi-square test of homogeneity[31] was used to test for differences between the relative risks of strata; the null hypothesis was that there was no difference between the relative proportions of matches by students from high-AIDS versus low-AIDS medical schools. The results of these and the multivariate analyses are discussed.

Ordinary least-squares multiple-regression models were used to control for factors in the socio-demographic backgrounds of students, including the propinquity indicator, all of which may have played roles in residency decisions. City-specific AIDS cumulative incidence at the hospital of residency was regressed on a set of inclusive independent variables, with the exception of a variable indicating the impact of exposure to AIDS in medical school. In the next stage, the unexplained residual variance from the first equation was regressed onto the variable indicating exposure to AIDS in medical school. This two-stage modeling approach was designed to isolate the effect of school AIDS exposure on choice of a high-AIDS residency program. A specialty and school interaction term also was entered into the second stage of the modeling.

Results

In 1980, 12,486 U.S. graduating medical students were matched through the NRMP and met the criteria for inclusion in this study. In 1983, the number of such students was 12,874, and in 1987, 13,941.

AIDS and Choice of Geographic Location of Residency

We first attempted to determine whether U.S. medical school graduates were influenced by the numbers of AIDS patients in the geographic locations of their residencies. Table 2 shows the numbers and percentages of students matching to various types of residency programs in high-AIDS locations and low-AIDS locations in 1980 and 1987. The proportions of matches to residencies in designated high-AIDS locations in 1987 as compared with 1980 defined the relative proportions of students matching to high-AIDS areas and are shown in Table 3. Students matching to categorical surgery programs were significantly less likely to choose a residency program located in a high-AIDS area in 1987 (relative proportion, 0.86; 95% confidence interval, 0.79-0.94). The decline in matches to high-AIDS surgical residencies was significant for students from high-AIDS schools (relative proportion, 0.86; 95% confidence interval, 0.79-0.93) but not significant for students from low-AIDS schools (relative proportion, 0.92; 95% confidence interval 0.77-1.09). Controlling for the numbers of positions available in surgical programs in different locations did not alter these findings. The only other program in which matches to high-AIDS residencies declined significantly over time was radiology, a finding accounted for by fewer residency slots in 1987 in high-AIDS locations.

Table 2

Numbers and Percentages of Students, in Terms of the Specialties They Chose, Who Were Matched to Residency Programs in Locations with High and Low Numbers of AIDS Patients, 1980 and 1987*

	Matched to Residencies in High-AIDS Locations†				Matched to Residencies in Low-AIDS Locations†			
	1980		1987		1980		1987	
Specialty	No.	%	No.	%	No.	%	No.	%
Internal medicine, categorical	1,793	48.1	1,617	46.8	1,932	51.9	1,837	53.2
Surgery, categorical	525	51.6	504	44.5	493	48.4	628	55.5
Family practice	297	17.6	352	19.9	1393	82.4	1418	80.1
Pediatrics, categorical	502	44.2	641	47.2	633	55.8	718	52.8
Obstetrics and gynecology	334	43.2	388	44.8	439	56.8	478	55.2
Psychiatry, categorical	220	53.4	326	47.7	192	46.6	358	52.3
Pathology	112	50.5	102	46.6	110	49.5	117	53.4
Radiology/nuclear medicine	98	34.3	47	19.4	188	65.7	195	80.6
Surgical subspecialties	139	39.3	188	35.7	215	60.7	339	64.3
Transitional‡	314	31.2	387	39.6	693	68.8	590	60.4
Total, all students	5,160	41.3	5,906	42.4	7,326	58.7	8,035	57.6

*Data are from the National Resident Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students).

†The locations of the residency programs were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

‡Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

Table 3

Relative Proportions, by Specialty, of 1987 Students (Compared with 1980 students) Who Were Matched to Residency Programs in Locations with High Numbers of AIDS Patients—Overall and in Terms of the Locations of Their Medical Schools*

	All Students		Students from Schools in Locations with High Numbers of AIDS Patients		Students from Schools in Locations with Low Numbers of AIDS Patients	
Specialty	Proportion†	Confidence Interval	Proportion†	Confidence Interval	Proportion†	Confidence Interval
Internal medicine, categorical	0.97	0.93-1.02	1.04	1.00-1.09	0.95	0.86-1.05
Surgery, categorical	0.86‡	0.79-0.94	0.86‡	0.79-0.93	0.92	0.77-1.09
Family practice	1.13	0.98-1.30	1.26‡	1.07-1.49	1.03	0.82-1.28
Pediatrics, categorical	1.07	0.98-1.16	1.03	0.96-1.11	1.17	0.98-1.40
Obstetrics and gynecology	1.04	0.93-1.16	1.05	0.96-1.16	1.20	0.95-1.51
Psychiatry, categorical	0.89	0.79-1.01	0.96	0.86-1.06	0.96	0.76-1.22
Pathology	0.92	0.76-1.12	1.04	0.91-1.20	0.82	0.59-1.15
Radiology/nuclear medicine	0.57‡	0.42-0.77	0.74	0.54-1.03	0.63	0.39-1.02
Surgical subspecialties	0.91	0.76-1.08	0.86	0.74-1.00	0.82	0.57-1.19
Transitional§	1.27	1.13-1.43	1.23	1.10-1.38	1.20	0.97-1.49
Anesthesia	1.18	0.91-1.52	1.20	0.96-1.51	0.82	0.51-1.30
Total, all students	1.03	1.00-1.05	1.05‡	1.02-1.08	1.03	0.97-1.09

*Data are from the National Residency Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students). The locations of the residency programs and of the schools were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

†The relative proportion is computed by dividing the percentage of students matched in 1987 to residency programs in high-AIDS locations by the percentage of students matched in 1980 to such programs.

‡The 95% confidence interval excludes 1.0.

§Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

Table 4

Relative Proportions of 1987 Students (Compared with 1980 Students) Who Were Matched to Given Specialties in All Locations—in Terms of the Locations of Their Medical Schools*

	Students from Schools in Locations with High Numbers of AIDS Patients		Students from Schools in Locations with Low Numbers of AIDS Patients	
Specialty	Proportion†	Confidence interval	Proportion†	Confidence interval
Internal medicine, categorical§	0.78‡	0.74–0.83	0.88‡	0.83–0.93
Surgery, categorical	0.99	0.87–1.12	1.01	0.90–1.12
Family practice	0.92	0.82–1.04	0.93	0.87–1.00
Pediatrics, categorical	1.09	0.97–1.23	1.06	0.96–1.17
Obstetrics and gynecology	0.92	0.80–1.07	1.06	0.94–1.21
Psychiatry, categorical§	1.27‡	1.06–1.52	1.67‡	1.42–1.96
Pathology	0.88	0.63–1.22	0.88	0.70–1.10
Radiology§	0.48‡	0.35–0.68	0.89	0.73–1.08
Surgical subspecialties	1.58‡	1.28–1.94	1.18	1.00–1.41
Transitional‖	0.99	0.86–1.14	0.80‡	0.72–0.89
Anesthesiology	1.30	0.94–1.81	0.84	0.68–1.04

*Data are from the National Residency Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students). The locations of the schools were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

†The relative proportion is computed by dividing the percentage of students matched in 1987 to a given specialty by the percentage of students matched in 1980 to the same specialty.

‡The 95% confidence interval excludes 1.0.

§The test for the difference between relative proportions is significant at the level of $p < .05$.

‖Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

In order to verify the finding that students from high-AIDS medical schools were less attracted to categorical surgical residencies in high-AIDS locations over time, we considered the interaction between choosing a categorical surgery program and originating from a high-AIDS medical school in a multivariate model. After controlling for students' background factors (derived from the SAIMS data-base), students from high-AIDS medical schools who chose categorical surgery programs in 1983 were significantly more attracted to residencies in high-AIDS locations (beta = 0.165, $p < .0001$) than were students choosing surgery in 1987 (beta = 0.037, $p > .05$). Thus, evidence from the multivariate analysis corroborated that from the bivariate analyses.

AIDS and Specialty Choice

We next examined the frequencies of student matches to specific specialties, regardless of location. Table 4 shows the relative proportions of students matching to given specialties in 1987 and in 1980; the table is separated into figures for those students originating from high- and low-AIDS-designated medical schools. The proportion of students matching to categorical internal medicine dropped from 1980 to 1987. This drop was greater for students from high-AIDS medical schools—as shown by the smaller ($X^2 = 7.29$; $p < .01$) relative proportion of matches among students from these schools (relative proportion, 0.78; 95% confidence interval, 0.74–0.83)—than among students from low-AIDS medical schools (relative proportion, 0.88; 95% confidence interval, 0.83–0.93). These differences could not be accounted for by changes in the numbers of positions available in categorical internal medicine in high- and in low-AIDS areas.

Table 4 also shows significant decreases between 1980 and 1987 for students matching to radiology (from high-AIDS areas) and to transitional programs (from low-AIDS areas). However, there were fewer 1987 residency slots available in locations where there were apparent declines. After controlling for the number of available positions, differences in the proportions of students matching over time to these specialties disappeared.

Since AIDS is most prevalent in large cities, and since some medical students who are selecting a residency may wish to avoid large cities in any case, it was desirable to try to remove the effect of being located in a city from the analysis. We compared the behavior of medical school graduates from high- and low-AIDS medical schools within selected cities having populations of over three million.[32] Categorical internal medicine's portion of the match declined significantly between 1987 and 1980, both for students from high-AIDS cities (relative proportion, 0.66; 95% confidence interval, 0.60–0.73) and for students from low-AIDS cities (relative proportion, 0.80; 95% confidence interval, 0.69–0.91). The relative proportion of students choosing internal medicine from high-AIDS cities was significantly lower than that for students from low-AIDS cities ($X^2 = 4.58$, $p < .05$). Thus, even after controlling for the effect of city location, students from high-AIDS schools were disproportionately less likely to match to categorical internal medicine programs.

Discussion

To our knowledge, these are the first published data on the possible impact of AIDS on medical student career selection behaviors. The findings that there were decreases in matching to categorical surgical programs in high-AIDS areas, and in matching to categorical internal medicine programs nationally, were consistent with our hypotheses. Surgery is the specialty that brings physicians into the greatest contact with potentially infective body fluids, while internal medicine is the specialty most likely in cities to provide care for patients who present with chronic and multiple organ system illnesses such as AIDS.

That AIDS is a factor in these trends is supported by attitudinal surveys and anecdotal evidence that show that some medical students may feel less attracted to residency programs that require caring for large numbers of AIDS patients,[18,19] and that some residents in high-AIDS medicine and pediatrics programs might choose differently if they had to select a residency again.[4] Fear of contagion and homophobia have been suggested as reasons for these attitudes.[17,18] We suggest that the generally young age and the emotional and physical neediness of AIDS patients, and the fact that they are all terminally ill, may also contribute to the reluctance of physicians-in-training to work extensively with them. For some medical students, the issue may be not one of avoiding AIDS patients altogether, but of avoiding certain residencies where their clinical experience would be likely to be dominated by such patients.

While factors other than likelihood of contact with AIDS patients might be contributing to these trends, our study was designed to limit such alternative explanatory factors to those that would be influencing students' residency decisions over the same time period and in the same specific geographic areas. In addition, we controlled for factors known from other studies to have an influence upon residency selection, such as student demographic factors[33] and changes in the number of available residency positions.

However, one alternative factor that could explain our results is a possible response of the students to the urban nature of the residency areas; these urban areas were also the places where there were many AIDS patients. The students may well have been discouraged from selecting large cities and certain specialties by their high costs of living and relatively low salaries, and the competition in cities among physicians practicing internal medicine as compared with other specialties. Although we found that even when we considered only densely populated urban areas, students from high-AIDS cities were less likely to choose categorical internal medicine than those from low-AIDS cities, we still cannot exclude the possibility that the influence of the urban environments in high-AIDS cities was different from that in low-AIDS cities.

Several methodologic limitations of the current study must be kept in mind. First, since we were limited to using currently available data, certain of our measures were of necessity imprecise. Figures on the incidence of AIDS patients were not available for each individual medical school and residency; thus, we used AIDS frequencies of the SMSAs in which programs were located. This inevitably resulted in some misclassification of the degrees of students' exposures to AIDS cases. However, assuming that this misclassification was not greater for students from schools of either high- or low-AIDS designation, such misclassification would tend to attenuate a relative risk (relative proportion) towards 1.0,[34] so that our findings would be an underestimation of real effects.

Second, because students' individually ranked residency choices were not available to us, we used match outcomes as the measure of student behavior. On the one hand, these were imperfectly correlated with students' ranked choices. On the other hand, they represent choices of specialty and location that had to be acceptable to medical students for training; thus, we believe that they are meaningful substitutes for individual rankings.

Finally, we were able only imperfectly to isolate the effect of the likelihood of contact with AIDS patients on residency choice behavior by controlling for potentially confounding student background factors in multiple-regression models. We believe that our lack of success in predicting the choice of categorical internal medicine with these variables stems from the heterogeneity of the group of students choosing this specialty track. These students go on to select careers as diverse as general practice and institutional research. We also did not have information on practice-related factors that may affect specialty choice, such as economic conditions, hospital working milieu, and research environment within high- versus low-AIDS areas.

The importance of our work is in the demonstration of a movement away from specialties and locations in which the care of AIDS patients is concentrated, no matter what the cause. The care of AIDS patients requires an adequate supply of physicians in the specialties needed for such care and in the locations where these patients are found. Further research is crucial to confirm these preliminary findings and to separate the effects of AIDS from other effects intrinsic to urban environments. We must then concentrate on whether there are factors that might attract prospective residents to high-AIDS programs, such as educational or support programs, special academically-enriched AIDS wards, or available hospice care for patients. The institution of educational and supportive programs for medical students and residents should not wait for the results of future research. Creating good programs can only enhance the experience, and thus the appeal, of caring for AIDS patients, and can only improve the humane quality of medical education generally.

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Racial-Ethnic Background and Specialty Choice: A Study of U.S. Medical School Graduates in 1987

DAVID BABBOTT, M.D., DEWITT C. BALDWIN, JR., M.D.,
CHARLES D. KILLIAN, M.A., and SHEILA O'LEARY WEAVER, M.S.

Abstract—This study used two Association of American Medical Colleges' questionnaires to determine whether there was a relationship between the racial-ethnic backgrounds and the specialty choices of a 1987 cohort of 11,136 U.S. medical school seniors, both prior to entering medical school and as they prepared for residency training. Their specialty preferences as premedical students were shown by their responses to the Premedical Student Questionnaire, administered when they registered for the Medical College Admission Test; their specialty choices at the end of their medical school training were shown by their responses to the Medical Student Graduation Questionnaire, which they completed shortly before graduation. Racial-ethnic backgrounds, self-recorded, were classified into black, other underrepresented minorities, Asian, other non-underrepresented minorities, and white. Specialties were clustered into primary care, medical specialties, surgical specialties, and supporting services. Before entering medical school, the students had similar specialty preferences regardless of background. As seniors in medical school, there was even greater convergence of specialty choices among the students of all backgrounds. Racial-ethnic background in itself appears not to have been a major factor influencing the senior medical students' specialty choices. *Acad. Med.* 64(1989):595–599.

The Association of American Medical Colleges (AAMC) annually surveys specialty plans of U.S. medical school seniors in the United States by means of the Medical Student Graduation Questionnaire (GQ), which is administered shortly before the students complete their National Resident Matching Program rank lists. Data derived from these surveys are incorporated into the AAMC's Student and Applicant Information Management System (SAIMS).[1] This comprehensive data bank contains information on all applicants to and students enrolled in U.S. medical schools, and on all residents in accredited U.S. residency programs. These data, in turn, may be linked to the AAMC Faculty Roster System and to the American Medical Association Physician Masterfile in order to study large numbers of physicians over extended periods of time.

A recent study[2] used SAIMS data to trace the development of early specialty preferences of U.S. medical school seniors in 1983 from the time they completed the Premedical Student Questionnaire (PSQ), administered when they registered for the Medical College Admission Test (MCAT), until they completed the GQ a few months before they graduated from medical school. The present study used SAIMS data concerning U.S. medical school seniors in 1987 in order to gain insight into the specialty aspirations of students in minority groups before they entered medical school, and to analyze the specialty choices of the same students as they prepared for residency training.

Method

The current study used SAIMS data comparable to those that formed the basis for the earlier 1983 study[2]: information obtained on the 1987 cohort from the PSQ, obtained when they registered for the MCAT as premedical students, and information from the GQ, which they completed as seniors in medical school. The method used to determine PSQ and GQ specialty interests was also the same as that in the 1983 study. In addition to specialty interests, each student's gender and racial-ethnic background were self-recorded.

Essentially all applicants to medical school take the MCAT and complete the PSQ; they are informed in writing that anonymity is guaranteed and that individual results are not forwarded to medical school admissions committees. The GQ is distributed to all U.S. medical school seniors through deans' offices; approximately two-thirds of all seniors respond to this survey.

The 7,525 men and 3,611 women in the class of 1987 who indicated specialty interests and ethnic backgrounds represented 70% of all U.S medical school graduates that year. The ratio of 67.6% men to 32.4% women in the cohort was almost identical to the ratio of 67.9% men to 32.1% women found among all U.S. medical school graduates in 1987. Data are not yet available to compare the various ethnic-racial groups' GQ specialty choices with their actual first-year residency appointments in 1987. Furthermore, because specialty plans of nonresponders to the GQ were not studied, it is possible that the 70% sample on which this study is

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Dr. Babbott is professor, Department of Medicine, and Ms. Weaver is biostatistician, Department of Medical Biostatistics, both at the University of Vermont College of Medicine, Burlington; Dr. Baldwin is director, Division of Medical Education and Information, American Medical Association, Chicago, Illinois; and Mr. Killian is senior research associate and director, Student and Applicant Information Management System, Association of American Medical Colleges, Washington, D.C.

Correspondence and requests for reprints should be addressed to Dr. Babbott, Department of Medicine, University of Vermont College of Medicine, Burlington, VT 05405.

Table 1

Numbers and Percentages, by Racial-Ethnic Background and Gender, of 11,136 Medical School Seniors, 1987*

Racial-Ethnic Background	Men		Women		Combined	
	No.	%	No.	%	No.	%
Underrepresented minorities†						
Black	252	3.3	201	5.6	453	4.1
Mainland Puerto Rican	31	0.4	19	0.5	50	0.4
Mexican American	93	1.2	43	1.2	136	1.2
Native American	28	0.4	19	0.5	47	0.4
Subtotal	404	5.4§	282	7.8	686	6.2§
Non-underrepresented minorities‡						
Asian	422	5.6	236	6.5	658	5.9
Commonwealth Puerto Rican	100	1.3	50	1.4	150	1.3
Other Hispanic	127	1.7	49	1.4	176	1.6
Subtotal	649	8.6	335	9.3	984	8.8
White	6,472	86.0	2,994	82.9	9,466	85.0
Total	7,525	100	3,611	100	11,136	100

*Data obtained from the students' responses, as premedical students, to the Premedical Student Questionnaire, administered at the time they registered for the Medical College Admission Test.

†Underrepresented minorities are those whose representations in the physician population are less than their representations in the total population.

‡Non-underrepresented minorities are those whose representations in the physician population are equal to or greater than their representations in the total population.

§This subtotal is not the exact sum of the numbers that compose it because some of them were rounded.

based does not accurately reflect all medical school graduates in 1987.

There are two studies of U.S. medical school graduates, however, that suggest that data derived from the 1983 GQ are reliable and valid. Babbott, Baldwin, and Jolly reported[2] that the proportions of GQ respondents planning residencies in family practice, pediatrics, surgery, psychiatry, and obstetrics and gynecology closely approximated the proportions of all 1983 U.S. medical school graduates who subsequently matched to these residencies. Dial and Elliott, in their study[3] of indebtedness and career plans of U.S. medical school graduates in 1983, reported that mean indebtedness of respondents to the GQ differed by only 0.7% from the mean indebtedness of the cohort, as determined by a 1983 survey of the Liaison Committee on Medical Education.

The 51 specialty options listed in the 1983 GQ[4] were classified into four major specialty categories: primary care, medical specialties, surgical specialties, and supporting services. Primary care included the three specialties that provide comprehensive and continuing care to both men and women: family practice, general internal medicine, and general pediatrics. The medical specialties option encompassed the 11 subspecialties of internal medicine, the six subspecialties of pediatrics, and allergy/immunology, dermatology, neurology/child neurology, psychiatry, and child psychiatry. The surgical specialties included general surgery, the nine subspecialties of surgery (including ophthalmology), obstetrics and gynecology, and their subspecialties. The supporting services included anesthesia, pathology, diagnostic and therapeutic radiology and nuclear medicine, rehabilitation medicine, public health/preventive medicine, and emergency medicine. Although the 1983 report[2] had clustered the specialty options into three major categories rather than the four used in the present study, specialty interests of the 1983 and 1987 cohorts can be compared because the identity of each of the 15 individual specialties and specialty groups had been preserved in each cohort.

Racial-ethnic backgrounds were classified in accordance with the AAMC method, which uses the population parity model.[5] Under this system, a minority group is classified as underrepresented if its representation in the physician population is less than its representation in the total population. Conversely, a non-underrepresented minority group in this classification is one whose representation in the physician population is equal to or greater than its representation in the total population. Using the AAMC classification, underrepresented minorities include blacks, Mexican Americans, mainland Puerto Ricans, and Native Americans. Non-underrepresented minorities include Asians, commonwealth Puerto Ricans, and other hispanic groups.

Each student's PSQ and GQ specialty interests were identified, and the students were categorized by gender and ethnic background. Log-linear analysis and simple chi-square techniques, incorporating multiple-comparison adjustment, were used to compare PSQ and GQ specialty interests among students of different racial-ethnic backgrounds.[6,7] Analysis of specialty plans by each individual's ethnic background and gender was not practical in every instance due to the relatively small numbers of students in some of the groups (See Table 1.)

In addition to comparing PSQ and GQ specialty interests of underrepresented minority students with those of all other students, as reported by the AAMC, the following comparisons were made: PSQ and GQ interests of black students with other underrepresented minority students, black students with white students, Asian students with other non-underrepresented minority students, and Asian students with white students.[4] These additional comparisons were undertaken in an effort to identify racial-ethnic-related patterns of change of specialty preference that might have been obscured had only one set of comparisons been analyzed.

Table 2

Numbers and Percentage of 11,136 Students, Classified by Racial-Ethnic Backgrounds and Gender, Who Preferred Given Specialties before Entering Medical School and Chose Given Specialties when Graduating from Medical School*

	Underrepresented Minorities†				Non-Underrepresented Minorities‡							
	Black		Other		Asian		Other		White		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Men before entering medical school												
Primary care	97	38.5	90	59.2	149	35.3	60	26.4	2,659	41.1	3,055	40.6
Medical specialties	21	8.3	11	7.2	55	13.0	37	16.3	741	11.4	865	11.5
Surgical specialties	85	33.7	27	17.8	101	23.9	82	36.1	1,829	28.3	2,124	28.2
Supporting services	20	7.9	12	7.9	37	8.8	29	12.8	471	7.3	569	7.6
Unknown	29	11.5	12	7.9	80	19.0	19	8.4	772	11.9	912	12.1
Total	252	99.9§	152	100	422	100	227	100	6,472	100	7,525	100
Women before entering medical school												
Primary care	84	41.8	34	42.0	103	43.6	36	36.4	1,220	40.7	1,477	40.9
Medical specialties	27	13.4	13	16.0	35	14.8	22	22.2	506	16.9	603	16.7
Surgical specialties	58	28.9	22	27.2	52	22.0	23	23.2	622	20.8	777	21.5
Supporting services	18	9.0	8	10.0	17	7.2	10	10.1	326	10.9	379	10.5
Unknown	14	7.0	4	5.0	29	12.3	8	8.1	320	10.7	375	10.4
Total	201	100.1§	81	100.2§	236	99.9§	99	100	2,994	100	3,611	100 §
Men when graduating from medical school												
Primary care	76	30.2	57	37.5	105	24.9	59	26.0	1,869	28.9	2,166	28.8
Medical specialties	44	17.5	36	23.7	93	22.0	43	18.9	1,237	19.1	1,453	19.3
Surgical specialties	80	31.7	34	22.4	142	33.6	85	37.4	2,026	31.3	2,367	31.5
Supporting services	48	19.0	17	11.2	76	18.0	39	17.2	1,218	18.8	1,398	18.6
Unknown	4	1.6	8	5.3	6	1.4	1	0.4	122	1.9	141	1.9
Total	252	100	152	100.1§	422	99.9§	227	99.9§	6,472	100	7,525	100.1§
Women when graduating from medical school												
Primary care	71	35.3	24	29.6	78	33.1	37	37.4	1,176	39.3	1,386	38.4
Medical specialties	48	23.9	21	25.9	60	25.4	30	30.3	782	26.1	941	26.1
Surgical specialties	50	24.9	21	25.9	58	24.6	16	16.2	587	19.6	732	20.3
Supporting services	29	14.4	11	13.6	36	15.3	14	14.1	408	13.6	498	13.8
Unknown	3	1.5	4	4.9	4	1.7	2	2.0	41	1.4	54	1.5
Total	201	100	81	99.9§	236	100.1§	99	100	2,994	100	3,611	100.1§

*The data for the premedical students' preferences were obtained from their responses to the Premedical Student Questionnaire, administered when they registered for the Medical College Admission Test. The data for the graduating students' choices were obtained from the Medical Student Graduation Questionnaire, completed shortly before graduation.

†Underrepresented minorities are those whose representations in the physician population are less than their representations in the total population.

‡Non-underrepresented minorities are those whose representations in the physician population are equal to or greater than their representations in the total population.

§Percentages do not total 100% because of rounding.

Results

Table 1 summarizes the racial-ethnic backgrounds of the students in the 1987 cohort. Black students constituted approximately two-thirds of the underrepresented minorities group, while Asian students accounted for a similar percentage of the non-underrepresented minorities group. Forty-four percent of the black students and 36% of the Asian students were women. Among the black students, the proportion of women was significantly higher than it was for the entire cohort of U.S. medical school graduates in 1987 ($p < .001$). Among the Asian students the percentage of women was somewhat higher than it was for the entire cohort ($p = .057$).

The top half of Table 2 summarizes the PSQ specialty preferences of the cohort categorized by gender into five racial-ethnic background groups: black, other underrepresented minority, Asian, other non-underrepresented minority, and white students. The bottom half of Table 2 summarizes GQ choices of the same students as seniors in medical school. Log-linear analysis of all data in Table 2 indicates some differences between the specialty choices of the men and the women. Specifically, the women were proportionately more likely than the men to choose medical specialties on the MCAT ($p < .001$, using parameter estimates from the appropriate log-linear model). As graduates, this tendency continued, with women also choosing primary care more frequently than did men ($p < .001$). The men were proportionately more likely to chose careers in surgical subspecialties and supporting services than were the women ($p < .001$).

There were a relatively small number of specialty preference differences in PSQ responses among those of both genders in some racial-ethnic groups. The black men tended to prefer surgical subspecialties proportionately more frequently than did the men in the other groups ($p < .05$), while the men in other underrepresented minority groups tended to prefer careers in primary care ($p < .001$). The Asian men were less likely to prefer surgical specialties than were the men in the other groups ($p < .01$), while other non-underrepresented minority men were more likely to prefer medical subspecialties or supporting services ($p < .05$), and less likely to prefer primary care ($p < .001$). Finally, the white men were less likely than the men in the other groups to prefer careers in supporting services ($p < .05$). The only significant trend among racial-ethnic groups observed for the women medical students was that a smaller proportion of white women preferred surgical specialties than did the women in the other racial-ethnic groups ($p < .05$).

By the time of the GQ, the differences in choices in terms of racial-ethnic background were less in evidence. Underrepresented minority group men other than black men were now less likely to choose careers in the surgical specialties and supporting services than were men in other racial-ethnic groups ($p < .01$). Non-underrepresented minority men other than Asians chose surgical subspecialties more often ($p < .05$). The white women were more likely to choose primary care at the time of the GQ ($p < .05$).

Within each racial-ethnic group, approximately 20% of the students who chose a specialty as premedical students chose the same specialty as seniors in medical school. Among the 80% of the students who changed their specialty interests during the same period, similar shifts of specialties were observed across racial-ethnic backgrounds. Men and women of almost all racial-ethnic groups indicated a decreased interest in primary care and an increased interest in the medical specialties and supporting services. Between the PSQ and GQ, the surgical specialties increased in popularity among the men; the women's interests in these specialties did not change significantly.

The findings discussed above were also studied using simple chi-square techniques, comparing various combinations of racial-ethnic groups. These further analyses revealed that students of different racial-ethnic backgrounds exhibited generally similar patterns of specialty preferences before entering medical school, and that these patterns became even more similar during the process of undergraduate medical education. At the time of taking the MCAT, underrepresented minority men preferred primary care significantly more frequently than did "all other" men ($p = .017$), while "all other" men preferred the medical specialties more frequently than did underrepresented minority men ($p = .021$). When the students were approaching graduation, however, these discrepancies were no longer evident. Underrepresented minority women preferred the surgical specialties more frequently than did "all other" women on both the PSQ ($p = .004$) and the GQ ($p = .033$).

At the premedical student stage, the black men were significantly less interested in primary care ($p < .001$) and more interested in the surgical specialties ($p < .001$) than were other underrepresented minority men. At the time of the GQ, however, similar proportions of black and other underrepresented minority men were interested in primary care. The black men as seniors, however, continued to be more interested in the surgical specialties than were the other underrepresented minority men ($p = .043$), and the black men had become more interested in specialties within the supporting services than had the other underrepresented minority men ($p = .037$).

There was no significant difference in specialty interests between the black men and the white men, or between the black women and the white women, either at the time of the Premedical Student Questionnaire or at the time of the GQ.

As premedical students, the Asian men were more interested in primary care ($p = .021$) and less interested in the surgical specialties ($p = .001$) than were the other non-underrepresented minority men. These differences were no longer significant at the time of the GQ.

Eighty-five percent of the men and women in the 1987 cohort were white. At the time of the MCAT, white men were more likely than all other men to prefer primary care ($p = .033$), but less likely than all other men to prefer a specialty within the supporting services ($p = .021$). These differences were no longer significant at the time of graduation. At the time of the MCAT, there was no significant difference in the frequencies with which the white women and all other women preferred primary care. As seniors, however, the white women preferred primary care more frequently than did all other women ($p = .016$). All other women preferred the surgical specialties more frequently than did white women, both as premedical students ($p = .017$) and as seniors in medical school ($p = .027$).

The PSQ and GQ specialty interests of the Asian and white students were almost identical. The only statistically significant difference between these groups occurred when, as premedical students, the white men preferred primary care more frequently than did the Asian men ($p < .001$). This difference was no longer significant at the time of the GQ.

Discussion

Cuca[8] studied data from the 1978 GQ in its first year of use on a national scale and reported on specialty choices of seniors classified into the same racial-ethnic background groups as are encompassed by the current study. She found that 42–56% of the seniors among each of the eight racial-ethnic backgrounds were planning careers within general internal medicine, family practice, or pediatrics (including pediatric subspecialties). Comparing these data with the 1987 cohort of U.S. medical school seniors (Table 2) demonstrates the dramatic decrease in interest in primary care that has occurred within the last decade among senior medical students of all racial-ethnic backgrounds. Furthermore, analysis of minority students' specialty choices from the 1985 GQ[9] reveal the same results as those observed in 1987: there was no statistically significant difference between the specialty choices of underrepresented minority group students and all other students ($p > .05$). Thus, the 1987 observation is not an isolated event. The similarity of GQ choices among students of both black and white backgrounds supports the observation of Adams and Bazzoli[10] that "specialty choices of blacks in total do not differ from those of whites." The findings also support the concept that racial-ethnic background per se does not significantly influence specialty choice among medical school seniors.

In the past, minority students and students from low-income families tended to select specialties within primary care, and to practice in underserved locations.[11] Thus, recruitment of minority groups into medical school not only provided increased professional opportunities for minority students, but also brought these primary care physicians to areas of great medical need. Pinn[12] has expressed the need for more minority students to have access to careers in academic medicine in addition to primary care, not only to serve as role models, but also to enable equitable fulfillment of career aspirations among physicians of minority backgrounds in our society.

In apparent contrast to earlier reports, the present study reveals a congruence of specialty choices among medical students of different ethnic backgrounds. This shift away from an interest in primary care among non-minority as well as minority students could have serious negative implications for health care delivery to minority groups and areas of physician shortage in the United States. It should be emphasized, however, that the end point of this study is neither clinical nor academic practice but the senior year of medical school; the possibility exists that the specialty goals of many minority students ultimately may not be realized. In the 1984 National Residency Matching Program, for instance, only 30% of minority students were matched to their first choice of residency program, and the 14% of minority students who went unmatched that year was more than two and one-half times the national norm.[13] In addition, National Resident Matching Program results in 1985, 1986, and 1987 substantiate Jordan's 1984 findings[14] that a higher proportion of minority students than other students failed to obtain first-year residency positions through the match. It is possible, therefore, that significant numbers of minority students who fail to be matched to the subspecialty of their choice end up in primary care not by desire but by default. Thus, follow-up studies during advanced residency training and beyond are necessary to further monitor the trend away from primary care among senior medical students of all racial-ethnic backgrounds.

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Early and Final Preferences for Pediatrics as a Specialty: A Study of U.S. Medical School Graduates in 1983

SUSAN E. COFFIN, M.D., and DAVID BABBOTT, M.D.

Abstract—The early and final specialty preferences for pediatrics made by 10,321 U.S. medical school graduates in 1983 were obtained from the students' responses to the Premedical Student Questionnaire, which accompanied their Medical College Admissions Test, and to the Medical Student Graduation Questionnaire, filled out not long before they graduated from medical school. A total of 11.5% of the women and 5.9% of the men expressed a preference for pediatrics on the earlier questionnaire, when they were premedical students; 13.5% of the women and 4.8% of the men actually chose pediatrics when they were senior medical students, as reflected on the later questionnaire. On both questionnaires, 31.3% of the women's preferences and 14.6% of the men's preferences for pediatrics did not change. More than 70% of all the graduating students choosing pediatrics had expressed a premedical preference for a primary care specialty. Fifty-one percent of the women and 42% of the men who abandoned their early preferences for pediatrics chose another specialty within primary care. More students of both genders shifted from a premedical preference for family practice into pediatrics than kept their early preference for pediatrics. If the direction of change noted in this study and others continues, pediatrics will increasingly become a specialty chosen by women. *Acad. Med.* 64(1989)600–605.

The health professions have experienced great changes over the past two decades that have significantly influenced the distribution of physicians among all medical specialties, including pediatrics. The number of students enrolled in U.S. medical schools in 1980 exceeded the number enrolled in 1970 by 81%.[1] Past discussions of physician shortages have been replaced by concerns of an impending (if not current) physician surplus. The percentage of women in medical school has soared from 7.7% in 1964–1965[2] to 32.6% in 1983–1984.[3] Because patterns of specialty choice for women are distinctive from those of men,[4-6] such a major change in the demography of medical trainees could lead to significant alterations in the distribution of medical personnel among the various specialty fields. Finally, increasing numbers of physicians are electing to pursue subspecialty training, leaving many health policymakers concerned that there will soon be a relative shortage of primary care providers.[7-9]

Although the 1980 report of the Graduate Medical Education National Advisory Committee[10] predicted for 1990 a "near-balance" provider-to-need ratio of 115% for pediatrics without oversaturation of its subspecialty fields, other investigators are less confident that these projections are accurate.[11,12] Although many factors affect the current distribution of physicians, some of the most profound influences are seen within the realm of undergraduate medical education.

The present study obtained the specialty preferences among a nationwide cohort of premedical students and compared their preferences with the specialty choices made by the same students as seniors. In so doing, both the stability (that is, nonchange) and change from early preferences were observed. Also, the predictive value of early specialty preferences was sought in order to better identify which students might choose careers as pediatricians and as primary care providers. Special attention was paid to the representation of women in medical school and the interests of medical students in primary care fields.

Method

This study used data from the Association of American Medical Colleges (AAMC) Student and Applicant Information Management System (SAIMS). Specifically, this study drew upon the responses to the Premedical Student Questionnaire (PSQ) and to the Medical Student Graduation Questionnaire (GQ).

The PSQ is administered to all individuals anticipating application to medical school as part of the Medical College Admission Text (MCAT) (most commonly taken one to two years prior to admission). For this reason a response rate approaching 100% is achieved. Included in the questionnaire are items concerning family background, prior work experiences, timing of decision to enter medical school, and anticipated specialty preference from a list of 15 different specialties options, including pediatrics and pediatrics subspecialties.

The GQ is distributed to all senior medical students several months before graduation. Within this questionnaire are items concerning personal and career plans, medical school experiences, and anticipated specialty choice. Individuals are asked to indicate from a list of 50

Dr. Coffin is a resident, Department of Pediatrics, Johns Hopkins Hospital, Baltimore, Maryland; Dr. Babbott is professor, Department of Medicine, University of Vermont College of Medicine, Burlington.

Correspondence should be sent to Dr. Coffin, Department of Pediatrics, Johns Hopkins Hospital, 600 North Wolfe St., Baltimore, MD 21205. Reprints will not be available.

specialties the field in which they plan to seek certification. For students without definite certification plans, "first choice area for certification" and "do not plan to seek certification" options are offered.

This study used information from the two questionnaires that was given by many of the U.S. medical graduates in 1983. A total of 10,321 individuals returned the GQ, a response rate of 65%. This cohort consisted of 7,557 men (73%) and 2,764 women (27%), with a man-to-woman ratio identical to that of the total group of graduating medical students in 1983. Individual specialty choices were obtained from certification plans if stated in the GQ, or from postgraduate-year-1 plans if certification plans were not stated. The specialty choice of each student was then compared with his or her specialty preference as reported in the PSQ. Through cross-tabulation of PSQ and GQ results the stability and change of specialty choice from the students' premedical period to just before graduation were disclosed.

Specialty options in the PSQ and the GQ were classified into three categories: primary care (family practice, pediatrics, pediatrics subspecialties, internal medicine, and internal medicine subspecialties); specialty care (obstetrics and gynecology, surgery, surgical subspecialties, and psychiatry); and supporting services (anesthesiology, pathology, radiology, rehabilitation, emergency medicine, and public health.

This classification of specialties was also used in a previous study of specialty choices of U.S. medical school seniors in 1983.[13a] The rationale for this classification scheme was based on: (1) Final decisions to subspecialize in pediatrics or medicine are not made until mid-residency or later, and (2) many subspecialists provide both specialty and primary care. More recent studies by Babbott et al. (see pages 595–599 in this issue) classify the various specialties into four categories: primary care, medical specialties, surgical specialties, and supporting services. In all these studies, pediatrics and pediatric subspecialties data are summarized separately to enable analysis of each individual specialty.

Due to the GQ's more extensive itemization of subspecialty fields within pediatrics, internal medicine, and surgery, all affirmative responses to any subspecialty within a given area were collapsed into a single "subspecialties" category, thus facilitating comparisons with PSQ results. Included in the PSQ was the option of selecting either family practice or general practice, a distinction that was not made in the GQ, where family practice, but not general practice, was listed as a specialty option. Due to the similarity of clinical work encompassed by these two fields, all PSQ responses indicating an interest in general practice were included in the family practice category. Finally, the PSQ failed to offer emergency medicine as a possible specialty option, a choice that was available on the GQ. When this specialty was selected, it was assigned to the supporting services category.

Table 1

Numbers and Percentages of Women and Men Choosing Specialties before Entering Medical School, U.S. Medical School Graduates, 1983*

	Women		Men	
Specialty	No.	%	No.	%
Primary care				
Family practice†	923	33.4	2,851	37.7
Pediatrics	319	11.5	445	5.9
Pediatric subspecialties	82	3.0	118	1.6
Internal medicine	152	5.5	604	8.0
Internal medicine subspecialties	208	7.5	452	6.0
All primary care	1,684	60.9	4,470	59.2
Specialty care specialties‡	440	15.9	1,589	20.9
Supporting services specialties§	275	9.9	512	6.8
Unknown	365	13.2	989	13.0
All non-primary care	1,080	39.0	3,090	40.7
Total, all specialties	2,764	99.9	7,560	99.9

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test.

†Includes all responses to the Premedical Student Questionnaire that indicated a preference for general practice.

‡Specialty care specialties were obstetrics and gynecology, surgery, surgical subspecialties, and psychiatry.

§Supporting services specialties were anesthesiology, pathology, radiology, rehabilitation, emergency medicine, and public health.

Results

Table 1 presents the distribution of premedical career preferences in terms of both large specialty groupings and the specialty preferences within primary care. Approximately 60% of both the men and the women were attracted to primary care specialties. Within primary care, men and women showed roughly equal interest in family practice, internal medicine, and internal medicine subspecialties. The women, however, demonstrated a marked preference for pediatrics and pediatrics subspecialties. Their interest in pediatrics fields before medical school entry was almost twice as great as was the men's. Across all specialties, the stability of individual specialty preference (meaning a specialty choice that remained unchanged between the PSQ and GQ) was 20.5%, with similar values for men and women (21.1% and 18.9%, respectively). For women, psychiatry (in the specialty care cate-

Table 2

Numbers and Percentages of Women and Men Whose Choices of a Specialty in Primary Care Remained Unchanged from before Entering Medical School until Graduation, U.S. Medical School Graduates, 1983*

Primary Care Specialty†	Women		Men	
	No.	%	No.	%
Family practice‡	200	21.7	714	25.0
Pediatrics	100	31.3	65	14.6
Pediatric subspecialties	11	13.4	3	2.5
Internal medicine	37	24.3	159	26.3
Internal medicine subspecialties	33	15.9	82	18.1
Overall	381	22.6	1,023	22.9

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Obstetrics and gynecology were not classified as primary care specialties in this study.

‡Data for family practice preferences include all responses to the Premedical Student Questionnaire indicating a preference for general practice.

gory) was the most stable preference (36.4% maintained their early preference), while for men an early interest in surgical subspecialties (also in the specialty care category) proved to be the most stable (40.6%)

Table 2 presents the preferences for primary care fields that remained stable. While comparable rates of stability were found for men and women with preferences for family practice, internal medicine, and internal medicine subspecialties, this was not true for the pediatrics fields. When compared with men with the same initial interests, women were twice as stable in their early preferences for pediatrics (31.3% versus 14.6%), and five times more stable in their preferences for pediatrics subspecialties (13.4% versus 2.5%). In addition, the stability rate of 31.3% among women with a premedical interest in pediatrics made this the second most stable of all specialty preferences for women.

Table 3 shows the net flux within each of the primary care fields. That is, primary care as a whole lost 20% of previously interested men and 9% of women during the time in which these students completed their undergraduate medical education. A significant attrition of men from pediatrics and pediatrics subspecialties (19% and 21%, respectively) occurred, although the greatest attrition of both men and women was from family practice, where it exceeded 60%. Women's interest in pediatrics fields, however, was found to increase over the course of medical school, with net gains of 17% in pediatrics and 12% in pediatrics subspecialties.

The left side of Table 4 presents the premedical career preferences of the persons who chose pediatrics at graduation. Here, 274 of 374 women (73.2%) and 296 of 361 men (82.0%) were found to have migrated into pediatrics from a different premedical specialty preference. An early preference for one of the primary care specialties characterized 71.9% of the women and 73.1% of men choosing pediatrics upon completion of medical school. Excluding the 100 women and 65 men with a stable premedical preference for pediatrics, 45.2% of the women and 55.1% of the men choosing to enter pediatrics had been interested in another primary care field before medical school. Family practice was the most common premedical preference of both the women and men choosing to enter pediatrics at graduation. Stable preferences for pediatrics constituted the next largest component of the group of men and women choosing pediatrics. The right side of Table 4 presents the GQ choices of persons with a PSQ preference for pediatrics. Here, 213 of 313 women (68.1%) and 372 of 437 men

Table 3

Numbers of Women and Men Who Chose Primary Care Specialties before Entering Medical School, Numbers of the Same Women and Men Who Chose Each Specialty at Graduation, and Percentages of Change of Choice for Each Specialty, U.S. Medical School Graduates, 1983*

Primary Care Specialty†	Women			Men		
	No. before Entering	No. upon Graduation	% Change	No. before Entering	No. upon Graduation	% Change
Family practice	923	343	−63	2,851	1,121	−61
Pediatrics	319	374	17	445	361	−19
Pediatrics subspecialties	82	92	12	118	93	−21
Internal medicine	152	491	223	604	1,272	111
Internal medicine subspecialties	208	239	15	452	744	65
Overall	1,684	1,539	−9	4,470	3,591	−20

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Obstetrics and gynecology were not classified as primary care specialties in this study.

(85.1%) migrated from an initial preference for pediatrics to another specialty. Among persons preferring pediatrics before medical school, 51.1% of the women and 42.1% of the men elected to remain within primary care. Essentially equal proportions of women and men emigrated from pediatrics into other primary care specialties, while a higher proportion of men than women emigrated into specialties within the areas of specialty care and supporting services. Internal medicine and obstetrics and gynecology were the next most common specialty choices of women emigrating from pediatrics. More men were attracted to surgical subspecialties than remained stable in their early preference for pediatrics or emigrated to any other specialty.

Discussion

This study has confirmed numerous past observations that pediatrics tends to be a "woman-dominated" specialty).[13b-15] Weisman has suggested that a convergence of male and female specialty patterns in medicine has begun over the past 15 years.[16] Although the current study does not address this issue of convergence, analyses of the 1982 and 1986 GQs do not indicate that women's and men's certification plans in pediatrics are converging. In 1982, 12.5% of female and 4.2% of male senior medical students planned to seek certification in pediatrics; by 1986, these percentages had dropped to 11.5% and 3.5%, respectively.[17] With essentially stable medical school enrollments in the United States and a decreasing proportion of medical students who are men, further declines in the specialty choice of pediatrics among men will result in an absolute decrease of male pediatricians. Thus, the discipline could become an increasingly female-dominated specialty. Whether an absolute decrease in the number of practicing female pediatricians will occur can be determined only by the balance of increasing numbers of female medical students with their apparent declining interest in pediatrics as a specialty choice.

Table 4

Patterns of Specialty Choice Migration into and out of Pediatrics, U.S. Medical School Graduates, 1983*

	Students Who Chose a Variety of Specialties before Entering Medical School but Who Chose Pediatrics at Graduation				Students Who Chose Pediatrics before Entering Medical School but Who Chose a Variety of Specialties at Graduation			
	Women		Men		Women		Men	
Specialty	No.	%	No.	%	No.	%	No.	%
Primary care								
Family practice	116	31.0	139	38.5	23	7.3	44	10.1
Pediatrics	100	26.7	65	18.0	100	31.9	65	14.9
Pediatrics subspecialties	18	4.8	14	3.9	16	5.1	13	3.0
Internal medicine	16	4.3	26	7.2	51	16.3	63	14.4
Internal medicine subspecialties	19	5.1	20	5.5	22	7.0	40	9.2
Subtotal	269	71.9	264	73.1	212	67.6	225	51.6
Specialty care								
Obstetrics and gynecology	26	7.0	3	0.8	35	11.2	27	6.2
Surgery	2	0.5	15	4.1	9	2.9	32	7.3
Surgical subspecialteis	6	1.6	10	2.7	14	4.5	78	17.8
Psychiatry	6	1.6	2	0.6	17	5.4	9	2.1
Subtotal	40	10.7	30	8.3	75	24.0	146	33.4
Supporting services								
Anesthesiology	2	0.5	1	0.3	6	1.9	21	4.8
Pathology	10	2.7	8	2.2	3	1.0	12	2.7
Radiology	0	0.0	1	0.3	11	3.5	23	5.3
Rehabilitation	5	1.3	1	0.3	2	0.6	2	0.4
Public health	11	2.9	11	3.0	0	0.0	0	0.0
Emergency medicine†	—	—	—	—	4	1.3	8	1.8
Subtotal	28	7.4	22	6.1	26	8.3	66	15.0
Unknown	37	9.9	45	12.5	0	0.0	0	0.0
Total	374	99.9	361	100.0	313	99.9	437	100.0

*This table shows specialty-specific patterns of migration into and away from pediatrics. Data were obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Emergency medicine was not offered as a choice on the Premedical Student Questionnaire but was offered on the Medical Student Graduation Questionnaire.

Premedical Preferences

The vast majority of premedical students favored specialties within primary care, with approximately 60% of both the men and the women indicating a preference for one of these five fields. Early popularity of primary care fields was also demonstrated in Bergquist's study[3] of 180 freshman medical students at the Medical College of Wisconsin. He, however, observed a marked female predominance in this preference, with 70.4% of the female students surveyed indicating an interest in a primary care field as opposed to only 44.4% of the man (Further analysis of the data in the present study revealed only small gender differences in premedical preferences for family practice, internal medicine, and its subspecialties, while, as noted earlier, pediatrics and its subspecialties attracted approximately twice as much interest proportionally among women than among men. These data correlated well with those of Gruppen and Brown,[5] who found essentially no gender differences in interests in family practice and internal medicine among 482 University of Michigan freshman medical students, whereas pediatrics appealed to 13% of the women as compared with only 7% of the men.

Stability of Premedical Preferences

The overall 20.5% rate of stability of early specialty preference that this study disclosed was substantially below comparable data generated by other studies evaluating the stability of career choice over the course of undergraduate medical education,[18-22] where stability rates as high as 55% have been reported. The 55% reported by Wasserman and colleagues,[18] however, was generated by a survey of only 106 medical students during their freshman and senior years.

In the present study, the rate of stability of initial choices for pediatrics made by women was more than twice that of the men who made such initial choices. This pattern of men migrating from an early preference of pediatrics has also been documented in studies by Zimet and Held[23] and Geertsma and Grinols,[19] where an initial interest in pediatrics among men was found to be the overall least stable specialty preference, while the choices for pediatrics among women were much more stable. The present study, however, discovered that the men's initial preferences for public health, pathology, and pediatrics subspecialties were even less stable than were their preferences for pediatrics, although the relatively small numbers of men abandoning pediatrics subspecialties and pathology preclude definitive interpretation.

Migration into Pediatrics

A preference for primary care characterized over 70% of the men and women who planned to enter pediatrics upon the completion of undergraduate medical education. Approximately 50% of the men and women who migrated into pediatrics during the course of medical school had indicated a preference for another primary care field on the PSQ. In a review of seven studies conducted from 1967 to 1982, Markert noted that less than one-third of the students choosing pediatrics at graduation had migrated from another primary care specialty.[24] Among both men and women choosing pediatrics, family practice had been the earlier specialty preference that was most frequently cited, followed by a stable preference for pediatrics. The women without a specialty preference when they completed the PSQ chose pediatrics more than twice as often as did the undecided men who were their counterparts. This finding suggests that the observed predominance of women choosing pediatrics is indeed related to gender rather than to the timing of the decision.

Migration out of Pediatrics

This study demonstrated distinct gender-related differences in the ultimate specialty choices of women and men with an early but unstable preference for pediatrics. While more than two-thirds of the women (70.4%) with a premedical preference for pediatrics chose to remain within the primary care area, less than half of the men who were their counterparts (46.3%) elected to do so.

This pattern of men migrating into surgical subspecialties in particular and specialty care and supporting services in general was also observed by Gruppen and Brown.[5] Following surgical subspecialties, internal medicine was the next most common specialty choice of men migrating from pediatrics. Among the women, internal medicine, followed by obstetrics and gynecology, attracted the largest numbers of individuals who changed their early preference for pediatrics, a pattern noted by Markert[26] in his review of seven studies of specialty selection.

Summary

At the time of this study, pediatrics continued to be a woman-dominated specialty, with greater interest from women before medical school entry, greater stability of early preference, and a net increase in the number of female students intending to enter pediatrics at graduation. Estimates, however, of both the number and gender of U.S. pediatricians in the future are difficult to make. With the decreasing percentage of medical students who are men and their declining interest in pediatrics, it is likely that pediatrics will become an increasingly female-dominated specialty. Nonetheless, it is difficult to predict the future contribution of women to the field of pediatrics. Concomitant increases in the number of women who are medical students appear to be somewhat offset by their apparent decreasing interest in pediatrics, and make predictions of the future percentage of women in this specialty difficult.

Finally, strong correlations were shown between an interest in pediatrics and a dedication to primary care. Fifty-one percent of the women and 42% of the men choosing to leave pediatrics entered other primary care fields. Forty-five percent of the women and 55% of the men migrating to pediatrics had indicated an early interest in another primary care field. In this time of increased concern over a dwindling commitment to primary care among medical students, an interest in pediatrics expressed before medical school begins might identify the students who would be most likely to enter primary care fields.

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Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty

DOUG CAMPOS-OUTCALT, M.D., and JANET H. SENF, Ph.D.

Abstract—Previous research has identified five characteristics of medical schools that are related to the choice of family medicine as a specialty: (1) the amount of time devoted to required training in family medicine, (2) the timing of the required family medicine training, (3) the type of ownership of the school (public or private), (4) the geographic location of the school, and (5) the administrative structure of family medicine within the school. These five characteristics of U.S. medical schools during the mid-1980s, together with the school tuition levels, were examined with both univariate and multivariate analysis to observe their relationships to the percentage of U.S. medical graduates entering family medicine between July 1986 and December 1987. With univariate analysis, each characteristic was significantly related to the percentage of graduates entering family medicine. Using multivariate analysis, only the number of weeks required and the type of ownership of the school were significantly related to the percentage of graduates entering family medicine, with the higher percentages related to greater numbers of required weeks of family medicine training and to public ownership of the school. *Acad. Med.* 64(1989):610–615.

During the 1970s, the specialty of family practice grew rapidly. In part, this resulted from federal and state financial incentives. There were 1,016 family practice positions offered in the National Resident Matching Program (NRMP) in 1974, and 2,340 in 1980.[1] These residency programs were popular with graduates of U.S. medical schools, with over 70% of the positions being filled each year. Family practice residents during those years had higher MCAT scores and scored higher on scales of idealism than did their peers who chose other specialties.[2]

The past decade has been one of consolidation and slow growth. Table 1 shows the NRMP results from 1980 to 1988. The number of residency positions offered has increased by only 72; the percentage of positions filled by U.S. medical school graduates has remained above 70 in every year except 1985 and 1988. The number of positions filled by North American graduates other than U.S. medical school graduates has more than tripled, while the low representation of foreign medical graduates has not changed. Family practice residents in the early 1980s earned undergraduate grades and MCAT scores equal to the scores of those who chose other specialties during that time.[3]

The match results of 1988 were a matter of concern to many family practice educators. The number of U.S. graduates who were matched in family practice was markedly lower than in previous years, as was the overall rate of positions filled. The results for 1989 are being analyzed to determine whether what occurred in 1988 was an exception or the beginning of a trend. There is some evidence that medical students are becoming less interested in primary care careers, although up to 1988 most of this decline in numbers had been due to a decreasing number of graduates choosing general internal medicine.[4]

If family medicine is to remain attractive to present and future medical students, educators in the field must understand the motivation of students and the factors that affect their specialty selection. While studies of students in earlier eras may not apply to today's students, they can indicate possible directions for research.

The purpose of this study has been to use recent data from all U.S. medical schools to assess the interrelationships among tuition levels and the other factors found by previous studies to be associated with students' choice of family practice.

The Previous Studies

Markert has summarized 12 studies conducted between 1967 and 1982 that show a dramatic decrease in students' preferences for family practice between the first and last years of medical school.[5] Up to 75% of students choose a specialty during the third or fourth year.[6] Special family medicine tracks, involving a continuous emphasis on family practice throughout medical school, increase the percentage of students choosing the specialty,[7,8] and there is some evidence that clerkships affect specialty choice.[9] Because medical students often obtain negative images of family medicine from other specialists, it has been proposed that early exposure to family practice role models is necessary to offset this influence.[10] Studies have not consistently shown that early exposure actually makes a difference.[6,11]

Medical schools with stronger departments of family medicine graduate higher percentages of students going into family practice.[12,13] Students who attend schools with a required third-year clerkship in family practice are more likely to enter the specialty than are students from schools with a required fourth-year clerkship; schools with no required family practice clerkship produce lower percentages of students entering family medicine, although 77% of all students choosing a family prac-

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Dr. Campos-Outcalt is assistant professor, and Dr. Senf is research assistant professor, Department of Family and Community Medicine, University of Arizona College of Medicine, Tucson.

Correspondence and requests for reprints should be addressed to Dr. Campos-Outcalt, Department of Family and Community Medicine, College of Medicine, University of Arizona, Tucson, AZ 85724.

Table 1

Numbers of Positions Offered in U.S. Family Practice Residencies and Numbers and Percentages of the Positions Filled, 1980–1988*

Year	No. Positions Offered	Positions Filled by U.S. Graduates No.	%	Positions Filled by Other U.S. and Canadian Graduates† No.	%	Positions Filled by Foreign Medical Graduates No.	%	Total % Filled
1980	2,340	1,703	73	70	3	45	2	78
1981	2,370	1,727	72	60	3	71	3	78
1982	2,362	1,757	74	74	3	109	5	82
1983	2,353	1,681	71	173	7	42	2	81
1984	2,359	1,773	75	195	8	43	2	85
1985	2,372	1,626	69	232	10	40	2	80
1986	2,390	1,680	70	245	10	35	1	82
1987	2,395	1,728	72	216	9	35	1	83
1988	2,412	1,494	62	230	9	43	2	73

*The information for this table comes from the yearly summaries of National Resident Matching Program results published in *Academic Medicine*.

†These graduates are from U.S osteopathic schools and Canadian medical schools; physician candidates (that is, earlier U.S. graduates seeking positions in graduate medical education); "fifth pathway" students (that is, U.S. nationals who completed course requirements for a medical degree abroad followed by a year of clinical training in a U.S. hospital under medical school sponsorship); and U.S. foreign medical graduates.

tice residency come from such schools.[9] The geographic location of a medical school also appears to have some influence on specialty choice, although this has not been studied in conjunction with all the other factors mentioned.[13]

Rising tuition levels are particularly worrisome because the resulting educational debt may affect specialty choice; a 37% increase in debt level between 1981 and 1986 paralleled a drop in interest in primary care.[4] Another indication of a potential link is the study by Rabinowitz[9] that showed that among the variables of class size, school age, type of school ownership, and clerkship status, the type of ownership of the medical school (public or private) was the most important variable predicting the percentage of graduates choosing family practice. He did not, however, look at tuition level as a factor separate from ownership. Two studies early in this decade did not document an effect of debt on specialty choice[14,15]; one later study did find some relationship, with students having higher debt levels choosing subspecialties more often.[16]

Method

The dependent variable studied was the percentage of students graduating from each U.S. medical school during a one-year period between July 1986 and June 1987 who were family practice residents in December 1987.[17] Puerto Rican schools were not studied. During this period there were 15,872 graduates, and 1,911 (12%) were residents in family practice programs in December 1987. The independent variables studied were the following school characteristics: (1) total annual tuition and fees; (2) number of weeks of required clinical training in family practice in post-basic science years; (3) timing of the required family practice training; (4) geographic location; (5) type of ownership (private or public); and (6) administrative structure of family practice within the school.

Information about tuition and fees was obtained from the AAMC handbooks on admission requirements for the years 1984–85 and 1986–87.[18,19] These years were chosen to provide two sources of tuition data for years when all the graduates being studied were attending medical school, regardless of the length of the curriculum. The dollar amounts used in this study for resident tuition and fees for the individual schools were calculated by averaging the amounts listed in the two editions of the handbook. The number of weeks and the timing of required clinical training in family practice were obtained from the *1986–87 AAMC Curriculum Directory*.[20]

To be included, curriculum time had to be listed as being in family practice, family medicine, or family and community medicine and had to be taken after the completion of the basic science training (the equivalent of being in the third or fourth year of a standard four-year curriculum). Courses listed as ambulatory care, community medicine, or preventive medicine were not included, nor were elective courses. The course was listed as being required before the fourth year if it was situated in year three of a four-year curriculum, year two in a three-year curriculum, or year five in a six-year curriculum. It was listed as not being required before the fourth year if (1) it was listed as required in year four of a four-year curriculum, in year three of a three-year curriculum, or year six in a six-year curriculum, or, (2) it was required but could be taken in either the last or the next-to-last year. A family practice course that was required in both years was listed as being required before the fourth year. Family practice courses required concurrent with basic science courses were not counted. No attempt was

Table 2

Percentages of 1986 and 1987 U.S. Medical School Graduates Entering Family Medicine and Numbers of Schools by Categories of Selected Medical School Characteristics*

Characteristic	% Entering	No. Schools	*F*	*p*
Average tuition and fees per year				
Less than $2,790	14.9	31		
$2,790 thru $4,999	16.0	31		
$5,000 thru $9,999	13.6	29		
$10,000 or more	6.9	32		
			9.5	<.001
Weeks of requred family medicine				
None	10.0	77		
Less than six	14.4	25		
Six	19.3	10		
Eight	23.0	11		
			15.1	<.001
Required experience before fourth year				
Not required	10.0	77		
Not required before fourth year	16.8	18		
Required before fourth year	18.0	28		
			15.4	<.001
Region				
New England	7.2	9		
Middle Atlantic	8.1	21		
East North Central	14.5	19		
North West Central	15.0	12		
South Atlantic	12.5	24		
East South Central	15.2	9		
West South Central	16.0	13		
Mountain	16.0	5		
Pacific	14.7	11		
			2.3	<.05
Ownership				
Private	9.1	51		
Public	15.5	72		
			21.6	<.001
Structure of family medicine within school				
Department	14.6	97		
Division/section	8.5	9		
None	4.6	17		
			15.5	<.001

*The data on students are for all those who graduated from 123 U.S. medical schools between July 1986 and June 1987 who were family practice residents by December 1987. The school characteristics had been identified by earlier studies as being significantly related to the choice of family medicine as a specialty. The data on the characteristics used in this study were obtained from the Association of American Medical Colleges directories of admissions requirements for 1984–85 and 1986–87.

made to separate clerkships from preceptorships.

Each school was classified in one of nine geographic areas comparable to those used by Goldsmith.[13] The type of ownership of each school (public or private) was obtained from the 1988 medical education issue of the *Journal of the American Medical Association.*[21] The administrative structure of family practice was described by the American Academy of Family Physicians[22] and was listed as department, division/section, or none.

The initial analysis looked at the univariate relationship of each independent variable to the percentage of graduates who entered family medicine. The second analysis was multivariate, including all of the independent measures in an analysis of variance.

Results

All 123 U.S. medical schools were included in the study; 72 were public and 51 private. There were 97 departments of family practice, nine divisions of family practice, and 17 schools (all private) with no formal family practice structure. Forty-six schools required family practice to be taken in the post–basic science years, and 28 required it prior to the last year; 21 schools required six or more weeks of study. Twenty-eight percent of the private schools and 44% of the public schools had a family practice requirement.

The initial analysis of variance showed that each of the measures identified by previous studies was significantly related to the percentage of graduates entering family medicine, in the direction expected when a single variable, tuition level, which had not been studied before, had a relationship consistent with the hypothesis that increased tuition, and presumably increased debt, is related to lower percentages of graduates entering family medicine, although this relationship was most striking when tuitions were above $10,000. Table 2 shows the relationship for each measure to the percentage of graduates entering family medicine.

Two of the variables, required weeks and required experience before the fourth year, were so strongly related to one another that they were combined in a single variable for the multivariate analysis. This variable had five categories: none required, less than six weeks required but not before the fourth year, less than six weeks required before the fourth year, six weeks or more required but not before the fourth year, and six weeks or more required before the fourth year. Other variables were also strongly related to one another. Two of the most striking instances of this were that (1) none of the schools with

Table 3

Unadjusted Percentages and Adjusted Percentages (by Analysis of Variance) of 1986 and 1987 U.S. Medical School Graduates Entering Family Medicine, and Numbers of Schools, All by Categories of Selected Medical School Characteristics*

Characteristic	Entering Unadjusted %	Simple Beta	Entering Adjusted† %	Partial beta	No. Schools	*F*	*p*
Average tuition and fees per year							
Less than $2,790	14.9		9.8		31		
$2,790 through $4,999	16.0		12.2		31		
$5,000 through $9,999	13.6		14.6		29		
$10,000 or more	6.9		14.7		32		
		.44		.25		1.2	.30
Weeks of required family medicine and timing of requirement							
None	10.0		10.6		77		
Less than six/not before fourth	13.6		12.2		13		
Less than six/before fourth	15.3		13.9		12		
Six or more/not before fourth	25.2		24.8		5		
Six or more/before fourth	20.0		19.7		16		
		.53		.45		9.2	<.001
Region							
New England	7.2		9.7		9		
Middle Atlantic	8.1		10.5		21		
East North Central	14.5		13.5		19		
North West Central	15.0		13.5		12		
South Atlantic	12.5		12.1		24		
East South Central	15.2		12.0		9		
West South Central	16.0		16.2		13		
Mountain	16.0		12.0		5		
Pacific	14.7		16.4		11		
		.37		.26		1.2	.29
Ownership							
Private	9.1		9.2		51		
Public	15.5		15.4		72		
		.39		.38		6.4	.01
Structure of family medicine							
Department	14.6		13.5		97		
Division/section	8.5		11.3		9		
None	4.6		9.7		17		
		.45		.17		1.6	.20

*The data on students are for all those who graduated from 123 U.S. medical schools between July 1986 and June 1987 who were family practice residents by December 1987. The school characteristics had been identified by earlier studies as being significantly related to the choice of family medicine as a specialty. The data on the characteristics used in this study were obtained from the Association of American Medical Colleges directories of admissions requirements for 1984-85 and 1986-87.

†This column is the percentage of graduates entering family medicine adjusted for the effect of all the other variables in the table.

a division/section or with no formal structure had required time in family medicine in the third or fourth year, whereas 47% of the schools with a department did have required time; and (2) Tuition level was related to ownership of the school, with only a few private schools in the lower half of the tuition range and only a few public schools in the upper half.

The results of the initial analysis of variance are presented in Table 3. The second column is the percentage of graduates entering family medicine, adjusted for all the other variables in the table. The significance level reported is for the adjusted percentages. To the right are the numbers representing the simple and partial betas from the regression analysis, which for each variable decline as controls are introduced. Clearly these variables share much of the variation in the percentage of students entering family medicine; only the amount and timing of required family practice training and ownership of school are significant when the other variables are used for controls. Overall, the variables account for almost half of the variability in the percentage of students entering family medicine. The multiple R (that is, the multiple correlation between percentage entering family medicine and all the independent variables) is .69, and R^2 (that is, the amount of variation in the percentage entering family medicine explained by the independent variables) is .48.

The final analysis of variance included only the amount of required time and ownership of the school. The combination variable (that is, the number of required weeks and timing) was dropped in favor of number of required weeks alone, since the difference between before the fourth year or not before the fourth year was not significant when number of weeks was controlled. While there was some loss of prediction in removing the additional variables, the two remaining still produce a multiple R of .62 and an R^2 of .38. The adjusted percentage of students entering family medicine rose from 10.4% for schools with no required time to 22.2% for schools with eight weeks of required time ($F = 19.5$, $p < .001$). Private schools had an average of 9.7% entering family medicine compared with 15.0% for public schools (adjusted percentage, $F = 19.5$, $p < .001$).

Discussion

Each of the six variables studied was associated in the expected direction with the proportion of graduates choosing family practice. However, when controlling for all other variables, only two, public versus private ownership of the school and the number of weeks of required family practice curriculum time, were significant.

Contrary to the hypothesis, a school's level of tuition and fees was not related to the choice of family practice as a specialty when other variables were considered simultaneously. Even though it seems logical that increased levels of debt might lead students to choose more lucrative specialties, this may be counterbalanced by the fact that less lucrative specialties such as family practice require less post-graduate training and allow debt repayment to start sooner. Tuition level, of course, may not be a good proxy for student debt. This subject deserves further study.

The results indicate that the number of weeks of required family practice curriculum time is important, more so than is the timing of the requirement. This finding is surprising, given what is known about the timing of choice of specialty and the presumed importance of previous experience in family medicine in influencing students to choose this field. It is possible that required time reflects total time studying family practice, and as total time increases, it would tend to be distributed across all years of study, making the earlyness or lateness of the required time less important. This finding also needs to be explored further.

Several studies have shown that the number of medical students who state a preference for family practice upon matriculation is much larger than the number eventually entering a family practice residency. While some students who state a preference for family practice are not affected by their experiences in other clerkships,[14] others do change their specialty preferences based on negative impressions of family medicine gained during medical school.[23] It would appear that the greater the exposure to family medicine, the more likely it is that students will find the field appealing. It may also be that stronger family practice departments have better role models and at the same time are more successful at obtaining larger amounts of required curriculum time. Exposure per se need not be a positive influence; students could be influenced negatively by a poor educational experience.

The important relationship between school ownership (public versus private) and the proportion of graduates choosing family practice has been documented elsewhere.[9] Our hypothesis that this relationship might be due to tuition levels was not correct. While it is true that private schools have higher tuition, less influential family practice representation, and less required family practice curriculum time, these characteristics do not explain the smaller percentage of graduates choosing family practice. It is possible that public schools, being more dependent on public funds, are under more pressure to produce primary care physicians. This may result in a different emphasis during the selection of applicants for admission. It is also possible that students who choose private schools may be less inclined towards primary care.

This study involves students who graduated in a one-year span of time, its generalizability to other years remains to be determined. The results do, however, suggest that there is a strong relationship between amount of exposure to family medicine and the percentage of students choosing family medicine as a specialty. Since this study was cross-sectional in design, further research is needed to determine whether increasing the curricular time for family medicine would lead to an increase in the percentage of students choosing family medicine.

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Initial Career Choices of Medical School Honors Graduates in the Early 1970s and 1980s

WILLIAM E. GOLDEN, M.D.

Abstract—To investigate the changes over time in the attractiveness of a number of medical specialties as careers, the author analyzed the initial career pathways of students who graduated with honors in 1972, 1973, 1982, and 1983 from nine of the most prestigious American medical schools. The data were analyzed to discern career selection differences among the total population studied, between the men and women, and between the graduates of public and private institutions. Internal medicine showed statistically significant declines in its attractiveness to the students in all the categories but remained overrepresented as a career choice by honors students compared with its attractiveness to medical students in general for the years studied. Radiology was chosen by an increasing percentage of the honors students in the 1980s, but mostly by students from private medical schools. The men who were honors graduates in the 1980s chose surgery fields more often, while women honors graduates tended to enter pediatrics and obstetrics-gynecology. These data indicate that the career choices of honors graduates in the early 1980s more closely mirrored the career choices of all students entering medical specialty fields and do not reveal gross imbalances. Of the primary care disciplines, only internal medicine attracted fewer honors graduates in the 1980s. *Acad. Med.* 64(1989): 616–621.

Recent difficulties of prominent internal medicine residency programs in filling their housestaff programs have led some medical educators to decry the shift away from internal medicine training.[1,2] Others have stated that the data to demonstrate shifts in career selection to procedural fields by graduating students do not exist. Nevertheless, the total number of applicants to internal medicine programs has declined.[3]

Shifts in career attractiveness may occur years before they are easily discernible in large shifts in demographic data. The effects of reimbursement trends, factors relating to practice, and the underlying science of a discipline can contribute to changes in specialty selection. Since specialty selections can begin in the college years, years may pass before changes in students' perceptions of desirable medical specialties are seen when students make their final selection of residency positions. Furthermore, gross statistics on the rates at which students are matched with first-year residencies can obscure career selection information, because some students may not match in a specialty of choice, and because many first-year programs are intended only as a preliminary year before other specialty training.

Students who graduate with honors at prestigious medical schools are the most likely to have the widest array of unimpeded career options. For this reason, their choices can reflect the relative attractiveness of careers in the various specialties. This paper examines the changes in career choices of honors students from highly ranked medical schools from the early 1970s and the early 1980s to determine whether there has been a shift in career selection by the best and the brightest students in the medical education system.

Method

All students who graduated with honors or as members of Alpha Omega Alpha (AOA), the medical school honor society, during the years 1972, 1973, 1982, and 1983 from 11 prestigious medical schools were eligible to be subjects of this study. The students from the selected years were identified by records obtained from AOA, graduation programs, and the schools' offices of student affairs.

The schools were selected because each was ranked among the top 12 medical schools by each of two independent evaluations.[4,5] Of the 11 schools selected for inclusion in this study, two were unable to supply data pertaining to AOA or honors graduates for students in the early 1970s. The remaining nine schools (Columbia, Cornell, Duke, Johns Hopkins, University of Michigan, University of Pennsylvania, University of California at Los Angeles, University of California at San Francisco, and Yale) supplied 676 names (293 from 1972 and 1973, and 383 from 1982 and 1983). The increase in honors graduates between the two periods slightly exceeded the increase in enrollments of the schools in this sample (13% versus 15% of graduates). The data on the students' career choices were retrieved from one of two records: the Directory of Medical Specialists[6] or the American Medical Association Masterfile.

This study sought information on the initial career choices of the students at the completion of medical school. Those trainees who changed disciplines prior to obtaining board certification in a specialty were categorized by their fields of first intention. Specialty changes consistent with traditional training pathways were categorized according to those

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Dr. Golden is director, Division of General Internal Medicine, University of Arkansas for Medical Sciences, Little Rock.

Correspondence and requests for reprints should be addressed to Dr. Golden, Division of General Internal Medicine, University of Arkansas for Medical Sciences, 4301 W. Markham, Slot 641, Little Rock, AR 72205.

pathways. Thus, an individual who spent one year as a surgical intern and then went into pathology was counted as a general surgeon, but one who spent two years in general surgery before starting a urology residency was counted as a urologist. Similarly, a trainee who completed one year of internal medicine before going into dermatology was counted as a dermatologist, but the trainee was counted as an internist if he or she completed two years of internal medicine prior to entering a dermatology residency. Virtually all were evaluated in this manner except for a few individuals for whom complete records were not available. Those individuals were counted as selecting the specialties of their first board certifications. All records were double-checked for accuracy, and the records of those individuals whose training patterns were unorthodox were analyzed carefully by the author and his research assistant prior to categorization.

Data for each physician were collected and compiled using a database program, and statistical work was performed using either a mainframe computer or a microcomputer spreadsheet program. The career choices for 1972 and 1973 were combined, as were the career choices for 1982 and 1983, to provide the maximum data for comparison and to discount patterns that could have been unique to a single class of graduating students. Differences between groups were assessed using the chi-square test or Fisher's exact test if values were less than 5 for a study cell.

To assess the relationship between training selected by honors graduates and that selected by all U.S. medical graduates (USMGs), the percentage of study subjects in a specialty was divided by the percentage of USMG housestaff in that discipline (relative weighting) for the year 1974 or 1984. Data for the USMG housestaff distributions in 1974 and 1984 were extrapolated from tables in the annual American Medical Association medical education report and the Directory of Approved Internships and Residencies.[7-10]

Results

Career data were obtained for all 676 graduates. Ninety-three percent of the 1970s sample were men; 71% were men in the 1980s group, a substantial change. The proportions of women in these samples approximated the percentages of women in the graduating classes of the two time periods. The percentage of students in public schools was 40% in both data sets.

Table 1 summarizes the first career choices of the two groups of honors graduates studied. Only internal medicine and neurosurgery suffered statistically significant declines in career selection by graduates ($p < .01$). Family practice and radiology were the only two specialties to have increases, with p values $< .05$, whereas pediatrics and general surgery had large upward trends ($p < .1$). Emergency medicine did not offer formal training in the early 1970s and so comparisons are not meaningful. No one surgical subspecialty had a statistically significant increase in selection, and the differences in collapsed totals for all surgical fields, excluding obstetrics and gynecology, also did not attain statistical significance.

Stratification of the data by sex demonstrated differences in career choices, even though the data for the women in the 1970s are insufficient for most analyses. As shown in Table 1, the men selected training in surgical specialties and radiology significantly more often in the 1980s than did their colleagues a decade earlier. The men and women in the 1980s each chose internal medicine less frequently than did the men in the 1970s ($p < .01$). The 1980s women chose pediatrics ($p < .01$) and obstetrics and gynecology ($p < .05$) much more frequently than did the 1980s men, and these women tended not to enter surgical specialties ($p < .01$). The women in the 1980s chose internal medicine less frequently than did the men (32% versus 38%), but this difference did not reach statistical significance.

Table 2 shows the significant differences, within each time period, between the choices made by the students at the three public schools and the choices made by the students at the six private schools considered in this study. The private school graduates in both time periods tended to prefer internal medicine more than did those honors students in the public universities studied. Private school honors graduates tended not to enter radiology and dermatology in the 1970s, while public university graduates did not pursue psychiatry. Family practice was a career chosen more frequently by public university honors graduates in the 1980s ($p < .01$). No other career choices within the years studied in the two decades differed enough to reach statistical significance.

Table 3 shows the significant differences, across the two time periods, between the choices made by the students within each type of school. Graduates of both public and private universities lessened their selection of internal medicine in the 1980s ($p < .05$). Private school graduates reduced their preference for neurosurgery ($p < .01$) and increased their interest in radiology training ($p < .01$). Family practice gained significant popularity only in the public university setting.

The final data analysis examined the career choices of the honor student cohort in relationship to career selections of all USMGs in that era. (See Table 4.) A discipline was categorized as overweighted when the proportion of honors graduates selecting the field divided by the proportion of USMG housestaff in that field for approximately the same time period (either 1974 or 1984) was greater than 1.3. Those fields with proportions under 0.70 were considered underweighted.

Most fields increased their relative weightings from the 1970s to the 1980s. Neurology, urology, radiology, otolaryngology, and ophthalmology made sizable relative gains. The dramatic gain in relative weighting for neurology reflects its very strong underweighting in the previous decade. The gains made by surgical programs did not result in overweighting of honors students in those fields, but

Table 1

Numbers and Percentages of 676 U.S. Medical School Graduates Who Made Each Career Choice in the Early 1970s and 1980s, with Various Statistical Comparisons*

	1972 and 1973 Graduates						1982 and 1983 Graduates					
	All Graduates		Men		All Women		Graduates		Men		Women	
Career	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
General surgery	21	7	19	7¶	2	10	42	11§	35	13	7	6**
Cardiovascular	3	1	3	1	0	0	4	1	4	1.5	0	0
Neurosurgery	11	4	11	4	0	0	2	.5†	2	.7	0	0
Ophthalmology	7	2.5	7	2.5	0	0	14	4	11	4	3	2.7
Orthopedics	7	2.5	7	2.5	0	0	13	3	13	5	0	0¶
Otolaryngology	2	1.5	2	.7	0	(0)	5	1	3	(1)	2	(2)
Plastic surgery	4	1.5	4	1.5	0	0	2	.5	2	.7	0	0
Urology	2	.5	2	.7	0	0	7	2	5	2	2	2
Total surgery	57	19	55	20¶	2	10	89	23	75	28	14	12.5‖
Internal medicine	149	51	138	50.5‖	11	55	141	37†	105	39	36	32
Pediatrics	25	8.5	21	7.5	4	20	48	12.5§	25	9	23	20.5‖
Family practice	4	1	4	1.5	0	0	15	4‡	9	3	6	5
Obstetrics-gynecology	12	4	12	4.5	0	0	20	5	10	4	10	9¶
Anesthesiology	2	.5	2	.7	0	0	6	1.5	6	2	0	0
Dermatology	3	1	3	1	0	0	4	1	1	.5	3	2.7**
Emergency medicine	0	0	0	0	0	0	4	1	2	.7	2	2
Neurology	1	.5	1	.5	0	0	6	1.5	4	1.5	2	2
Pathology	14	5	14	5	0	0	11	3	8	3	3	2.7
Psychiatry	13	4.5	12	4.5	1	5	15	4	8	3	7	6
Radiology	7	2.5	5	2‖	2	10	22	6‡	17	6	5	4.5
Miscellaneous	6	2	6	2	0	0	2	.5	1	.5	1	1
Total, all specialties	293	100	273	100	20	100	383	100	271	100	112	100

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$ in comparing the 1970s and 1980s graduates.

‡$p < .05$ in comparing the 1970s and 1980s graduates.

§$p < .1$ in comparing the 1970s and 1980s graduates.

‖$p < .01$ in comparing the 1970s men and 1980s women with the 1980s men.

¶$p < .05$ in comparing the 1970s men and 1980s women with the 1980s men.

**$p < .1$ in comparing the 1970s men and 1980s women with the 1980s men.

Table 2

Significant Differences, within Each of Two Time Periods, between the Career Choices of Honors Graduates from Six Private and Three Public Medical Schools

	1972 and 1973 Graduates				1982 and 1983 Graduates			
	Private		Public		Private		Public	
Career Choice	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing
Internal medicine	98	56	51	44‡	93	41	48	31§
Family practice	2	1	2	2	4	2	11	7†
Psychiatry	11	6	2	2‡	11	5	4	3
Radiology	1	0.5	6	5‡	12	5	10	6.5
Dermatology	0	0	3	2.5§	3	1	1	0.5

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$; ‡$p < .05$; §$p < .1$.

Table 3

Significant Differences, across Two Time Periods, between the Career Choices of Honors Graduates within Each of Two Types of School*

	Private				Public			
	1972 and 1973 Graduates		1982 and 1983 Graduates		1972 and 1973 Graduates		1982 and 1983 Graduates	
Career Choice	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing
Internal medicine	98	56	93	41†	51	44	48	31‡
Family practice	2	1	4	2	2	2	11	7‡
Neurosurgery	8	4.5	1	0.5†	3	2.5	0	0.5
Plastic surgery	1	0.5	2	1	3	2.5	0	0§
Radiology	1	0.5	12	5†	6	5	10	6.5

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$; ‡$p < .05$; §$p < .1$.

rather represented increases that brought honors student selection of those fields in line with the selections of their classmates. This trend can best be seen by collapsed values for surgery, which indicate a modest increase in relative weighting from .70 in the 1970s to 1.03 in the 1980s. Indeed, no surgical field was overweighted in the 1980s. Moreover, neurosurgery and plastic surgery suffered relative reductions in popularity and became underweighted.

Family practice and anesthesiology remained underweighted, while most disciplines underweighted in the 1970s group increased their graduate shares to a neutral level. Radiology was the only field to go from an underweighted to an overweighted status.

Only a few specialties suffered declines in their relative weightings: internal medicine, neurosurgery, plastic surgery, and pathology. Despite its relative decline, internal medicine remained one of the most overweighted disciplines selected by honors students, but far less so than in the 1970s. Neurosurgery suffered the largest relative decline in popularity from its greatly overweighted status in the 1970s.

Discussion

During the 1970s, medical manpower was subject to several forces simultaneously: expansion in medical school

Table 4

A Comparison of the Career Choices Made by 676 U.S. Medical School Graduates in the Early 1970s and 1980s with the Career Choices of All U.S. Medical School Graduates in Approximately the Same Two Time Periods*

	1972 and 1973		1982 and 1983	
Weighting Category†	Career	Weighting	Career	Weighting
Overweighted	Neurosurgery	3.66	Pediatrics	1.44
	Internal medicine	2.0	Internal medicine	1.31
	Pathology	1.45	Radiology	1.31
Neutral	Cardiovascular surgery	1.24	Cardiovascular surgery	1.28
	Plastic surgery	1.01	Ophthalmology	1.28
	Pediatrics	.91	Urology	1.15
	Obstetrics-gynecology	.73	Pathology	1.09
			Obstetrics-gynecology	.87
			Orthopaedics	.89
			Neurology	.89
			Psychiatry	.83
			Otolaryngology	.81
			General surgery	.77
			Dermatology	.70
Underweighted	General surgery	.67	Neurosurgery	.66
	Ophthalmology	.59	Plastic surgery	.55
	Dermatology	.57	Emergency medicine	.37
	Psychiatry	.56	Family practice	.31
	Orthopedics	.47	Anesthesiology	.22
	Radiology	.43		
	Otolaryngology	.32		
	Urology	.27		
	Anesthesiology	.25		
	Family practice	.19		
	Neurology	.16		

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†Career choices were categorized as overweighted if the proportion of honors graduates selecting the discipline divided by the proportion of U.S. medical school graduates housestaff selecting that field during approximately the same time period (1974 or 1984) was greater than 1.3. Those fields with a proportion under 0.70 were considered underweighted.

enrollments, increased percentages of women in training, alterations in the relative payments to different specialties, a rising debt burden of medical trainees, and the growth of medical technology, to name just a few. Changes in training selection can be obscured by alterations in the percentages of foreign medical graduates, barriers to entering a specialty, and lack of enough time to discern patterns of change. This study examined the career choices of the honors students at the most prestigious medical schools as the most likely way to learn the directions in training of the best students in the medical education system.

The data obtained in this study indicate that honors graduates in the early 1980s chose careers in a more diffuse and balanced manner than did their counterparts in the 1970s and that this pattern of choices was much like the pattern of choices made by all U.S. medical school graduates during those years. While internal medicine has suffered a statistically significant decline in career selection since the 1970s, it remained overweighted in the 1980s, thus demonstrating its overwhelming predominance as a career choice in the 1970s. The migration of applicants away from internal medicine occurred in two major patterns: a movement of men into surgical specialties and the preferences of women for careers in pediatrics and obstetrics-gynecology. Pediatrics faces many of the same economic and training problems as internal medicine, but increased its share of honors graduates, particularly among women, and slightly among men as well. Radiology had a statistically significant increase in career choices, but this growth was tempered by sizeable increases only among men and private school graduates among the students selected for this study.

Because of the small number of women honors graduates in the 1970s cohort, direct comparisons of specialty choices were not meaningful for most fields. Internal medicine, however, had sufficient numbers to demonstrate a statistically significant decline in career interest in this field by women honors graduates ($p < .01$). In fact, this decline was greater than that seen for the men. Women entered pediatrics and obstetrics-gynecology at a rate nearly double that of men.

In the literature, analysis of residency training differences by sex for all graduates in 1982[8,10,11] shows that while women made up only 23% of the housestaff population in 1982, they accounted for 50% of pediatrics residency positions. Sixteen percent of all women went into pediatrics in 1982, which is slightly below the 20% seen in the honors cohort for that year. Similarly, only 8% of all women went into surgical fields, as opposed to the 12.5% seen in the honors cohort. From this and other data, it is clear that there are differences in medical career preferences between men and women and these differences may be due to training environment, specialty content, and perhaps practice style. As the number of women in medicine expands, more attention may need to be paid to these differences.

Family practice appealed to few honors graduates in the 1970s; this fact may reflect the early development of this specialty. Nevertheless, despite statistically sizeable increases, the 1980s honors cohort chose family practice far less often than did their classmates, and the relative increase in honors students entering family practice occurred almost entirely at public university medical schools. This trend probably reflects the lack of development of family practice at many private medical schools and the legislative requirements and support for such training at public institutions.

Anesthesiology attracted relatively few honors graduates compared with USMG residents, but the data in this study underestimate the eventual distribution of honors graduates. Many individuals switch into anesthesiology after starting surgery or internal medicine residencies, and this switching would not be found by the methodology of this study.

The trends for students' choices in the early 1980s may have changed by now (1989). But because this study examined confirmed residency data, only in the upcoming years will a follow-up study be possible. Use of data from the residency matching program would miss some specialty selection, because many graduates would be in preliminary programs in medicine and surgery and therefore could be incorrectly categorized.

Although this study reviewed the recorded training experience of honors graduates, it examined their first-intention career choices only, and not their final career paths. This approach, however, provides more accurate results than recording the data from the residency match, because that approach would overemphasize transitional training choices at the expense of later subspecialty career choices. Therefore, these data contain a few distortions resulting from migration patterns of physicians in training. For example, the number of trainees in general surgery is falsely elevated because several individuals opted for radiology, anesthesia, or pathology after one or two years of surgical residency. Similarly, internal medicine lost graduates to radiology, anesthesiology, and dermatology, but these graduates were categorized as internists because of their continuation into a second year of residency in that field.

Recent data from the Association of American Medical Colleges indicate that most students pursue careers that they had originally desired.[12] There may be barriers to entry in some of the most limited specialty fields, but the author has assumed this factor should not come into play with the group of students in this study.

Some of the comparisons may not have reached statistical significance because of the small number of graduates in this study, but general trends are discernible from the data. Similarly, because of fairly small numbers of trainees in some specialty fields, the relative weighting figures should be taken as estimates and not precise measurements.

In conclusion, career choices among honors graduates from prestigious medical schools have changed over the last two decades. The general trend is away from internal medicine, which attracted a predominance of these graduates in the 1970s, resulting in a relative underweighting of other specialties, particularly those in surgery. Pediatrics, which faces many of the same training and practice problems as internal medicine, increased its share of honors graduates, particularly among women. The figures from the 1980s indicate a more balanced pattern of career selection, with no one field attracting honors graduates out of proportion to its trainee population.

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AAMC DATA REPORT

Present Activities of 1989 U.S. Medical Graduates

Yearly since 1983 the Association of American Medical Colleges (AAMC) and the National Resident Matching Program (NRMP) have tracked all U.S. graduates and all residents who were in programs accredited by the Accreditation Council for Graduate Medical Education (ACGME). The results of this tracking for the 1989 U.S. medical school graduates are presented in the two tables of this data report. The AAMC defines graduation year on an academic calendar basis of July 1 through June 30. Most of the 1988–89 graduates are entering first-year residencies; however, two adjustments have been made to align the data with the NRMP cycle. First, the 75 late summer graduates have been omitted from the tables, because these graduates obtained residencies in the previous year and are thus generally in a second-year residency. Second, the 66 who graduated after July 1, 1989, but nevertheless were able to obtain a residency for 1989–90 are included.

Table 1 presents the numbers and percentages of all the

Table 1

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Ethnic-Racial Background and Gender

	Through NRMP		Outside NRMP		Total		Did Not Obtain Residency		Total, All Graduates	
Ethnic-Racial Background and Gender	No.	%	No.	%	No.	%	No.	%	No.	%
All graduates										
Underrepresented minorities										
Black	632	78.2	155	19.2	787	97.4	21	2.6	808	100.0
Indian	49	86.0	8	14.0	57	100.0	0	—	57	100.0
Mainland Puerto Rican	92	78.0	23	19.5	115	97.5	3	2.5	118	100.0
Mexican American	196	80.0	41	16.7	237	96.7	8	3.3	245	100.0
White	10,611	85.3	1,624	13.1	12,235	98.3	208	1.7	12,443	100.0
Commonwealth Puerto Rican	77	32.2	159	66.5	236	98.7	3	1.3	239	100.0
Other Hispanic	227	87.6	29	11.2	256	98.8	3	1.2	259	100.0
Asian	1,049	86.0	149	12.2	1,198	98.2	22	1.8	1,220	100.0
Unknown ethnic-racial background	202	87.1	25	10.8	227	97.8	5	2.2	232	100.0
Total, all graduates	13,135	84.1	2,213	14.2	15,348	98.3	273	1.7	15,621	100.0
Men										
Underrepresented minorities										
Black	289	75.3	92	24.0	381	99.2	3	.8	384	100.0
Indian	27	84.4	5	15.6	32	100.0	0	—	32	100.0
Mainland Puerto Rican	56	75.7	17	23.0	73	98.6	1	1.4	74	100.0
Mexican American	128	79.0	29	17.9	157	96.9	5	3.1	162	100.0
White	7,094	83.7	1,253	14.8	8,347	98.5	125	1.5	8,472	100.0

Table 1

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Ethnic-Racial Background and Gender *(Continued)*

Ethnic-Racial Background and Gender	Through NRMP		Outside NRMP		Total		Did Not Obtain Residency		Total, All Graduates	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commonwealth Puerto Rican	52	34.2	99	65.1	151	99.3	1	.7	152	100.0
Other Hispanic	153	86.0	23	12.9	176	98.9	2	1.1	178	100.0
Asian	666	84.2	111	14.0	777	98.2	14	1.8	791	100.0
Unknown ethnic-racial background	137	86.2	18	11.3	155	97.5	4	2.5	159	100.0
Total, all graduates	8,602	82.7	1,647	15.8	10,249	98.5	155	1.5	10,404	100.0
Women										
Underrepresented minorities										
Black	343	80.9	63	14.9	406	95.8	18	4.2	424	100.0
Indian	22	88.0	3	12.0	25	100.0	0	—	25	100.0
Mainland Puerto Rican	36	81.8	6	13.6	42	95.5	2	4.5	44	100.0
Mexican American	68	81.9	12	14.5	80	96.4	3	3.6	83	100.0
White	3,517	88.6	371	9.3	3,888	97.9	83	2.1	3,971	100.0
Commonwealth Puerto Rican	25	28.7	60	69.0	85	97.7	2	2.3	87	100.0
Other Hispanic	74	91.4	6	7.4	80	98.8	1	1.2	81	100.0
Asian	383	89.3	38	8.9	421	98.1	8	1.9	429	100.0
Unknown ethnic-racial background	65	89.0	7	9.6	72	98.6	1	1.4	73	100.0
Total, all graduates	4,533	86.9	566	10.8	5,099	97.7	118	2.3	5,217	100.0

1989 graduates who obtained their residencies through the match, who obtained their residencies by means other than the match, and who did not obtain residencies. The data are presented in terms of the residents' ethnic-racial backgrounds and genders. Those who did not obtain residencies include physicians involved in such activities as finishing Ph.D. work, pursuing research, traveling, and simply taking a year off, as well as an unknown number who were unable to obtain a position. Very few of these physicians are expected to be practicing, even though three states consider them eligible for licensure: Louisiana, Ohio, and Tennessee. Overall, these data are similar to those of past years. Black, Puerto Rican, and Mexican American graduates were more likely than were other graduates to obtain their residencies outside the match. Commonwealth Puerto Ricans showed very low match rates because few Puerto Rican hospitals participate in the NRMP. A higher percentage of black women (4.5%) were without residencies than was true for the graduates in any other category (not counting the categories with very small numbers of graduates). In fact, a slightly higher proportion of all women than of men are not in a residency.

Table 2 shows the total number of graduates and the number by gender enrolled in each type of residency program, both those graduates who obtained their positions through the match and those who obtained their positions by other means. The table also lists the activities of those graduates who did not obtain residencies. The residency programs of the military and of mainland Puerto Rico are listed separately as types of residencies rather than being intermixed among the appropriate specialties because few of these programs participate in the match. Overall, 85.6% of all 1989 U.S. medical school graduates obtained their residencies through the match. Several specialties obtained all of their U.S. graduates through the match. Psychiatry obtained 95%;

Table 2

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Graduates' Present Activity (Residency Specialty or Other Activity)

Present Activity	Obtained Residency through NRMP				Obtained Residency outside NRMP				
	Men	Women	Total	% of All Graduates	Men	Women	Total	% of All Graduates	Total, All Graduates
Residency									
Anesthesiology	153	45	198	84.6%	28	8	36	15.4%	234
Dermatology	6	3	9	100.0%	0	0	0	0.0%	9
Emergency medicine	214	81	295	93.1%	19	3	22	6.9%	317
Family practice	888	561	1,449	93.2%	68	38	106	6.8%	1,555
Internal medicine — preliminary	838	463	1,301	93.3%	72	21	93	6.7%	1,394
Internal medicine — primary care	133	101	234	97.5%	4	2	6	2.5%	240
Internal medicine and pediatrics	89	47	136	95.1%	5	2	7	4.9%	143
Internal medicine and psychiatry	4	0	4	100.0%	0	0	0	0.0%	4
Internal medicine	2,023	1,007	3,030	92.7%	168	71	239	7.3%	3,269
Neurology	14	8	22	88.0%	3	0	3	12.0%	25
Nuclear medicine	1	0	1	25.0%	3	0	3	75.0%	4
Obstetrics and gynecology	438	443	881	94.5%	27	24	51	5.5%	932
Ophthalmology	13	1	14	73.7%	3	2	5	26.3%	19
Otolaryngology	36	4	40	53.3%	29	6	35	46.7%	75
Pathology	145	107	252	81.3%	32	26	58	18.7%	310
Pediatrics — primary	11	17	28	96.6%	1	0	1	3.4%	29
Pediatrics	483	741	1,224	94.7%	29	39	68	5.3%	1,292
Physical medicine and rehabilitation	55	27	82	94.3%	2	3	5	5.7%	87
Preventive medicine (general)	2	0	2	66.7%	1	0	1	33.3%	3
Psychiatry	416	298	714	94.6%	31	10	41	5.4%	755
Radiology — diagnostic	187	74	261	97.8%	5	1	6	2.2%	267
Radiology — therapeutic	8	1	9	69.2%	3	1	4	30.8%	13
Surgery	787	172	959	79.1%	219	35	254	20.9%	1,213
Surgery — neurologic	21	2	23	51.1%	17	5	22	48.9%	45
Surgery — oral	0	0	0	0.0%	4	0	4	100.0%	4
Surgery — orthopedic	392	22	414	99.0%	4	0	4	1.0%	418
Surgery — plastic	6	0	6	85.7%	1	0	1	14.3%	7
Surgery — preliminary	490	76	566	81.8%	111	15	126	18.2%	692
Transitional	676	228	904	91.0%	58	31	89	9.0%	993
Urology	62	1	63	67.0%	28	3	31	33.0%	94
Military programs (all specialties;	0	0	0	0.0%	579	159	738	100.0%	738
Puerto Rican programs (all specialties)	11	3	14	9.0%	86	56	142	91.0%	156
Subtotal	8,602	4,533	13,135	85.6%	1,640	561	2,201	14.4%	15,336
Other activities									
Research	—	—	—	—	—	—	—	—	117
Unknown	—	—	—	—	—	—	—	—	83
Deceased	—	—	—	—	—	—	—	—	2
Non-medical activity	—	—	—	—	—	—	—	—	16
Year off	—	—	—	—	—	—	—	—	67
Total, all graduates									15,621

internal medicine, over 90%. The proportions of senior students obtaining their positions through the match were at high levels for most specialties.

Specialized reports can be produced by the AAMC for individual medical schools, hospitals, or disciplines.

August G. Swanson, M.D.
Richard R. Randlett
Robert A. Haynes, Ph.D.
Charles D. Killian

Dr. Swanson is executive director of the National Resident Matching Program (NRMP) and Vice President for Graduate Medical Education and International Programs, Association of American Medical Colleges, Washington, D.C. Mr. Randlett is deputy director of the National Resident Matching Program (NRMP) and Assistant Vice President for Student Services, AAMC. Dr. Haynes is research associate in the Section for Operational Studies, AAMC. Mr. Killian is senior research associate and director of the Student and Applicant Information Management System (SAIMS), AAMC.

Errata

On page 238 of the May issue of *Academic Medicine*, an error appeared in Table 2. In the column of the table with the heading "AMA," the first line should read "Office and hospital."

On page 240 of the same issue, the first phrase of the first sentence at the top of the page should have been "The author thanks James Cultice of HRSA."